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AN ACCOUNT OF THE WAR CUSTOMS OF THE OSAGES,

GIVEN BY RED CORN (HAPA ÓÜISE), OF THE TSIƆU PEACE-MAKING GENS, TO THE REV. J. OWEN DORSEY.

INTRODUCTION.

IN order to obtain a better understanding of the subject, it will be necessary for the writer to describe the order in which the Osages encamped in their tribal circle. When they went on their buffalo hunt in the summer they always pitched their tents in a certain order, according to the clans or gentes of which the tribe was composed. In the first diagram seven gentes camp on the left, and fourteen, considered as seven at present, on the right. Those on the left are the Tsi′-ɔu or Chee′-zhoo gentes, forming the peace element of the tribe; those on the right are the Hañ′-ka and Wa-ɔa′-ɔe (War-shar′-shay)[1] gentes, constituting the war element. The former could not take animal life of any sort, but were obliged to content themselves with vegetable food, till they made an agreement with those on the right to supply them with vegetable food in exchange for meat, which the Hañ-ka and Wa-ɔa-ɔe could obtain.

The Tsi-ɔu (Chee-zhoo) gentes are as follows: 1. Those who wear tails or locks of hair on the head. 2. Buffalo bull face. 3. Chee-zhoo peace-makers or red eagle. 4. Those who carry the sun on their backs, sun carriers. 5. Night people, or the

[1] Wa-ɔa-ɔe or Wa-zha-zhe, means *Osage*. The exact pronunciation cannot be shown by ordinary English characters. Hence the "c" = "sh" is inverted to show a sound between "sh" and "zh."

youngest Chee-zhoo. 6. Buffalo bull; and 7. Thunder people, or those who camp behind.

The gentes on the right are now in seven groups, the seven Wa-zha'-zhe gentes having been consolidated into two groups, and the seven Hañ-ka gentes into five groups. Before this consolidation was made, the tribe consisted of the seven Chee-zhoo fire-places or gentes on the left, and the seven Wa-zha-zhe fire-places on the right.

The following are the groups on the right, according to two authorities, Saucy chief and He-who-never-fails: 8. Elder Osages, including six of the Wa-zha-zhe fire-places. 9. Hañ-ka apart from the rest. 10. Ponka peace-makers (the leading gens

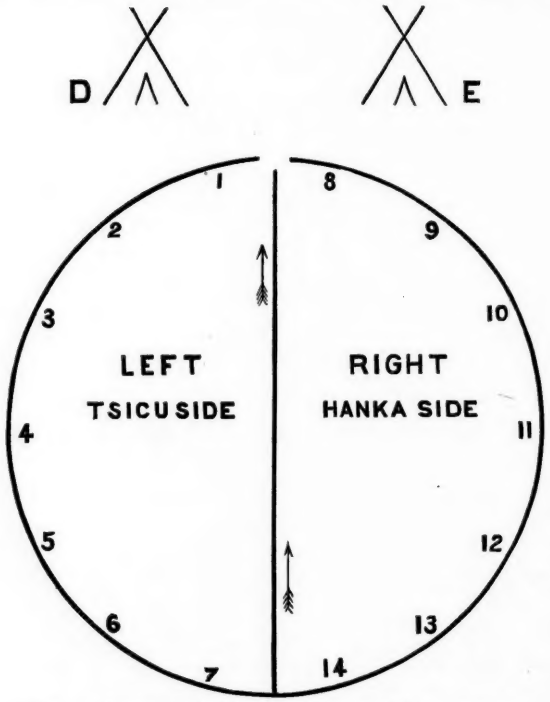

FIG. 1.—Osage tribal circle and the tents of the mourners.

on this side, as the Chee-zhoo peace-makers are on the left); they form a Wa-zha-zhe fire-place. 11. Hañ-ka having wings, an eagle gens. 12. Black bear. 13. Elk. 14. Kansas, pipe-light-

ers, or wind people. All but Nos. 8 and 10 are Hañ-ka fireplaces.

The line drawn through the circle denotes the road traveled by the tribe. This forms the boundary between the two half-tribes.

The following accounts of the Osage war customs are necessarily incomplete, being obtained from a member of the principal peace gens. Moreover, there are customs peculiar to each gens, which are not familiar to members of other gentes.

There are three kinds of war parties among the Osages. The first is the large war party, undertaken in the summer. The next the sacred bag war party, in which only a few engage at any season. The third is called "tsi'-ka-kha'," undertaken at any time, being an expedition after the horses and other property of the enemy.

I.—A Large War Party (Tu-ta^{n}'-hü Tan'ka).

When a man on the left side of the tribal circle is mourning for one of his family, he selects a man from the right side of the tribe to mourn with him, and to be the real leader of the expedition. Let us suppose that the first mourner is a Chee-zhoo peace-maker man. He must present the other man, whom we will call a Hañka (in full, Hañka-apart-from-the-rest), with one of his best horses. Then the Chee-zhoo chooses a kettle-bearer for himself, and this kettle-bearer builds a small lodge (*D*, Fig. 1) for his friend. It is on the west side of the village, and is made of two buffalo robes. The door faces the west. A similar lodge (*E*) is built for the Hañka mourner, by his kettle-bearer, on the right side of the circle, and towards the west, as in the figure. Each mourner stays alone in his lodge, seeing no woman.

As the Chee-zhoo is a peace gens, it has no war customs pertaining to it, so the Chee-zhoo mourner has to apply to a man of the first gens, Lock-wearers, to act as his teacher. The Lock-wearers and Buffalo-bull-face people are the soldiers or policemen of the Chee-zhoo peace-makers. Should the mourner fail to obtain a man of the first gens, he must ask one of the second gens, Buffalo-bull-face people, to instruct him. The Hañka mourner must select his teacher from one of the soldier gentes on his side, Elder Osages or Hañka apart from the rest.

Within four days of the time for departure, the mourners return to the village and begin their preparations. The Hañka mourner directs his teacher to select the time and place for

the final ceremonies. Whereupon the teacher goes to one of the heralds (an Elk or Kansas man), telling him to proclaim the news around the village.

All the people who wish to see the ceremonies take a sufficient number of tents and remove to the place outside the village, pitching their tents in a circle. The large tent of the Cheezhoo is put up on the left, at *A*, Fig. 2, and the corresponding tent of the right side is pitched at *B*. The latter is the leading tent when

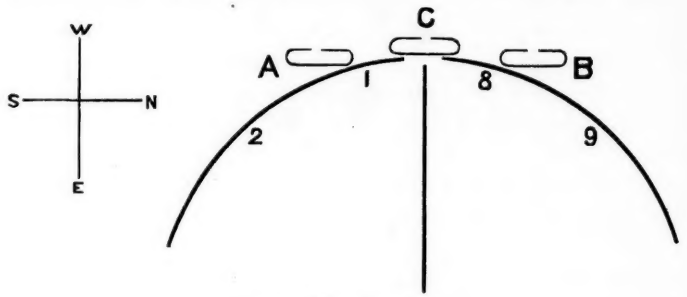

FIG. 2.—Plan of war tent.

the deceased belongs to the left side, and the former is the leading tent when the deceased belongs to the right side of the tribe. The leading side and tent must always be opposite to that to which the deceased belongs. The Cheezhoo peace-maker men, being of the gens of the mourner, lead all the men on their side of the tribe, who assemble at the tent *A*. So the Hañka men lead all the men on their side, who meet at *B*.

Each mourner receives a war pipe and a forked stick on which he can hang the bag in which the pipe is kept. The pipe is an old one handed down from preceding generations. Such pipes are always kept by those men who have taken a degree in the secret order of the tribe. The drum used on this occasion is made by a man of the Sun-carrier gens. Two battle standards are made for each mourner by an old man of the Elder Osage gens (Fig. 3). One on each side has seven feathers, and is reckoned as the superior one; and the other has six. The bottom of each standard terminates in a sharp point, which is used as a spear. When the two teachers ask the Elder Osage man to make the standards, they hand him a new knife, some paint, and all other materials required for them. When he finishes them the knife and the remaining materials belong to him. At the

same time the teachers give him some calico to pay him for his trouble. When the standards are completed, the old man says: "O Hañka and Cheezhoo, as you have paid me, take the standards quickly!" The Cheezhoo teacher takes his in his left hand,

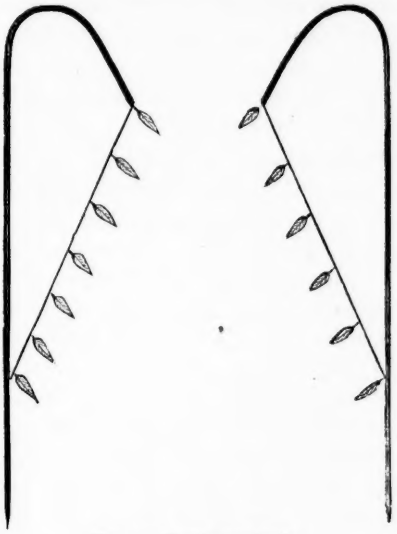

FIG. 3.—Battle standards.

and the Hañka extends the right hand for his standards. Then they lay down the standards before them.

Then the general war tent of the tribe (Figs. 2 and 4) is erected at *C*, facing the west, the place of honor being at the rear, towards the east.

All the principal men of each side, including the head men of the gentes, who are a sort of priests, meet in the war tent, *C*. There the drum beats. At the rear of the tent are seated the principal old men, one for each gens. The two mourners are still outside. By and by the mourners are brought into the tent, in which there is no fire. The two bags containing the war pipes are hung on their necks.

For this occasion two war bags are made of the feathers and skins of war eagles by some of the old men. These bags are now brought into the tent by the teachers, who present them to the mourners. The old men who made the bags now choose two or three men for each mourner, to act as Wa-sha'-pe wa'-shu-

wa'-kdhe, whom we may style lieutenants (though that is hardly the translation). These men drop their blankets and wear nothing but their breech-cloths as they stand in a row with their mourners. The old men who made the bags select a herald for each mourner out of any gens. These stand next to the lieutenants. Each lieutenant and herald receives a war pipe. The Cheezhoo herald receives in his left hand a knife with the handle painted red. The Hañka herald receives in his right hand a hatchet with the handle reddened.

Then the Hañka mourner (*B*) is brought to the front, and is told to select the best men on the Cheezhoo side for standard bearers. He chooses one (*E*), leading him to the front, the latter crying as he goes. To the latter is handed a standard with seven feathers by Cheezhoo's teacher. It is received in the left hand and the man performs a war dance according to his own desire or custom, and then he takes his seat. Then the Cheezhoo mourner is called to the front, being told to select the best man from the Hañka side for standard-bearers. The first that he chooses (*I*) is taken to the front, crying as he goes. Hañka's teacher hands him the other standard with seven feathers, which is received in the right hand. He dances, and sits down. Hañka's mourner selects a man from the opposite side (*F*) to carry the standard with six feathers; and Cheezhoo's mourner chooses a Hañka man (*K*) for a similar office. When the Hañka mourner selects the third man on the Cheezhoo side (*G*), the latter takes the standard from *E*, dances, and returns it to its holder. So when the Cheezhoo mourner selects the third man on the Hañka side (*L*), the latter takes the standard from *I*, dances, and returns it. The fourth standard-bearer on the Cheezhoo side (*H*) takes the standard from *F*, dances, and returns it. And the fourth man on the Hañka side (*M*) takes the standard from *K*, to whom he returns it after dancing.

Then the lieutenants are painted with charcoal. Before this is done, the Black bear people make a fire outside the war tent, placing on it a quantity of small willows which will soon burn. When these are charred, they are broken in small pieces and placed in pans, with a little water in each. Each lieutenant on the Cheezhoo side dips his hands into a pan, rubs them together, and then with his left palm he rubs his face, beginning at the right ear, and going down the cheek, across the mouth and left

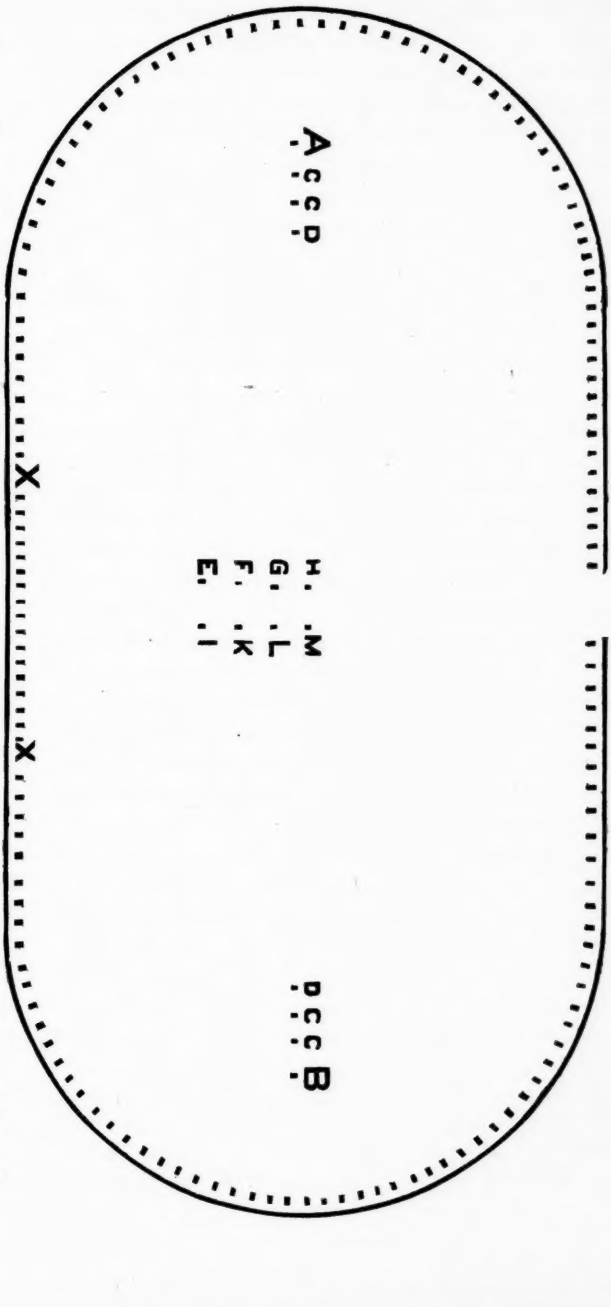

FIG. 4.—The war tent (*C*), showing the positions of the mourners, etc. From *X* to *X*, the twenty-one old men; *A*, the Cheezhoo mourner; *B* The Hañka mourner; *cccc*, the lieutenants; *dd*, the heralds.

cheek to the ear. Next he rubs his right palm across his left shoulder, bringing the mark a little to the front. Rubbing more charcoal on his hands, he places his left palm on his right shoulder, bringing the mark slightly to the front. With his right palm he makes a round mark on the chest, over the depression between the two parts of the sternum.

The lieutenants on the Hañka side proceed in a similar manner, but in reverse order, beginning with the right hand and ending with the left in making the round mark over the breast bone.

These men are now enlisted, and cannot sit down till night comes and the other warriors have lain down. The lieutenants, heralds, and standard-bearers can neither eat nor drink till they receive permission.

After the lieutenants finish painting, the two heralds are ordered to arise, one standing on the Cheezhoo mourner's left, the other on the Hañka mourner's right. They are sent from the tent, being ordered to go about a hundred yards from the village, and then run around it. They start from the west, Cheezhoo's herald going towards the north, and the other man running to the south. When the Cheezhoo man gets due north, and the Hañka is opposite him, the former cries to the latter: "O Hañka, he says that you will cause the spirits of the animals to pass along! He says that you must cause the spirits of the animals to pass along at sunset!" To this the Hañka man replies, "O Cheezhoo, he says that you must cause the spirits of the animals to pass along! He says that you must cause the spirits of the animals to pass along at sunset!" Just before they reach the east, they cry again, Cheezhoo speaking first. When they pass the east the Cheezhoo man goes outside of the other's course, keeping to the left of the latter. When the Cheezhoo reaches the south, and the Hañka is at the north, they cry again; and so when they return to the west. Then the large war tent (*C*) is taken down.

The Hañka mourner tells the Cheezhoo mourner and standard-bearers to collect their warriors, while he and his standard-bearers do likewise on the Hañka side. All the Cheezhoo men of the seven gentes have to prepare for the four days' dances. They also have to furnish a drum. They meet in their large tent (*A*) at the back of which are seated the four standard-bearers (*E*, *F*, *G* and *H*). The man who has the standard with seven feathers (*E*) is the principal one, so he sits on the left of the one with six

feathers (*F*). The standards are held with the feathers facing the west. The rest of the men sit around the tent. Then *E* selects all the young men who are to sit with the party as warriors, and the adult kettle-bearers, who prepare food for them. Of these latter there are from ten to twenty, no fixed number, and they have a separate camp. Next *E* selects about six youths who are fast runners, to act as kettle-bearers who give water to the warriors. The man who cooked for the mourner at the first, and made the small lodge for him, is the leader of the kettle-bearers on his side.

A man of the Sun-carrier gens is requested to make the drum for the party. He is furnished with the requisite implements, and gets a piece of calico as his pay. In the meantime the Hañka standard-bearers are doing similar things, but in a different order. In the Hañka tent (*B*) the man with the seven feather standard (*I*) sits on the right of the other, who has that with six feathers (*K*). No. 3 (*L*) is on the right of *I*, and No. 4 (*M*) is on the left of *K*. The adult kettle-bearers and the kettle-bearers who give water are chosen by the holder of the principal standard (*I*). A Sun-carrier man is hired to make the drum.

Then follows a dance around the village, while the two Sun-carrier men are making the drums. Prior to this dance the men of each party try to get ready and rise to their feet before the others. The mourners, lieutenants and heralds keep at a short distance from the singers and dancers. At each tent (*A* and *B*) a standard is raised. In modern times this is the U. S. flag.

The principal kettle-bearer on each side carries one of the flags, and he is followed by the rest, including the kettle-bearers or servants of both kinds. (See Fig. 5.) After the two parties pass each other, they walk in silence for about fifty yards, when the drums are sounded for another dance. (These drums are probably those which were used at the war tent *C*, as the new drums are not yet finished.) The dance is accompanied by a war song. Then they go silently as before; and so on till they arrive at the rear of the village. They sing and dance as they pass each other the second time; and so on till they return to the tents at the west. Then they have a dance, in which they tell what they expect to do when they meet the enemy. This must not be confounded with the bravery dance, which takes place afterward, according to Red Corn.

After this each mourner or war captain gives to his principal kettle-bearer a horse, which the servant sells to the man who will give the most food for it. The food is brought in and cooked by the adult kettle-bearers. The women are invited to a feast, but the men eat none of the food. Each woman brings a bowl of flour, coffee, etc. The kettle-bearers run to meet them, take the food and place it in a heap. At the end of the feast the empty bowls are handed to their owners. The food brought by the women is cooked and the men have their feast. Should the supply be insufficient another horse is sold for food, the women are invited to another feast, and they give more food in return for the

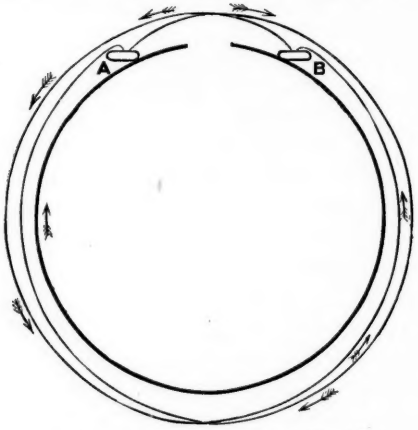

FIG. 5.—Dance around the Village.

men to eat. The dance is continued through the day, till about half an hour before sunset.

Then they dance the U-dhu′-ta wa-tsi$^{n'}$ or *circle dance*, in which the Cheezhoo men dance from the west to the north, thence to the east and south, and round to the west again. The men on the other side go in the opposite direction. In this dance the first standard-bearer on the Hañka side tells one of his exploits in a song, as he dances. He is followed by the leading Cheezhoo standard-bearer. The principal Hañka standard-bearer sings and dances again, and is followed, as before, by the first Cheezhoo standard-bearer. So the two sing and dance in turn till they have sung about twelve songs. A whoop is made and the men march a short distance to perform the dance called the bra-

very dance. They meet in front of the large Hañka tent (*B*), and the flag is hoisted (Fig. 6). All sit out of doors, forming a figure like a capital U, at the base of which are the standard-bearers. Next to them sit the warriors, and the kettle-bearers sit at the ends. The leading Hañka standard bearer (*I*) arises, sings and dances a little to the west, and then back to his place, when he resumes his seat. He is followed by the first Cheezhoo standard-bearer (*E*), after whom dances the second Hañka standard-bearer (*K*), who is succeeded by the Cheezhoo of the same rank (*F*). Next come the third Hañka and Cheezhoo men (*L* and *G*), then the fourth pair (*M* and *H*). Then the warriors dance in like manner. When they have finished the kettle-bearers may dance if they desire.

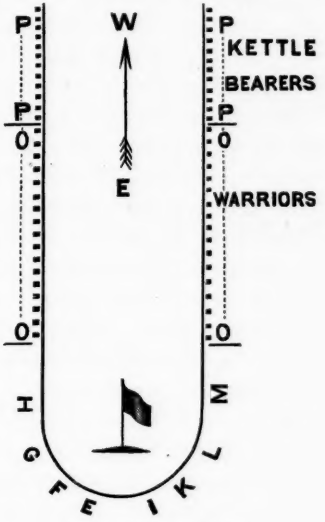

FIG. 6.—Bravery dance.

This ends the dances for the first day. Then the heralds make another circuit of the village, starting from their respective tents, *A* and *B*. After this the war captains, warriors and servants sit and rest, smoking and talking till it is time to sleep. The principal standard-bearer on each side (*E*, *I*) calls his war captain, telling him that on the morrow, just at daybreak, they must make the mysterious charcoal. Then the Hañka standard-bearer, *I*, tells his captain to inform the men that they can lie down. So one of the Hañka lieutenants cries over to those in the other camp: "Halloo, lieutenants!" One of the Cheezhoo lieutenants replies, "What is it?" The Hañka man says, "Ho! ye adult kettle-bearers, ye young kettle-bearers and ye standard-bearers! it is said that you shall sleep!" The Cheezhoo replies, "O, grandfather, it is well!" Then he addresses the men on his own side, but in a loud voice, so that those on the other side may hear, too: "Ho, O comrades, standard-bearers! Ho, O comrades, ye adult kettle-bearers! Ho, O comrades, ye young kettle-bearers! it is said that ye shall sleep!" Then the Hañka lieutenant calls again, "Ho, O lieutenant!" The Cheezhoo says, "What is the matter?"

The Hañka says, "O war captains and ye lieutenants! it is said, O comrades, that you shall sleep!" The Cheezhoo replies, "It is well, O grandfather!" Then he addresses the mourners and lieutenants on both sides, "Ho, O comrades, ye war captains! Ho, O comrades, ye lieutenants! it is said that ye shall sleep!" Then the Hañka cries again, "Ho, O lieutenant!" The Cheezhoo says, "O my grandchild! to-morrow you shall cause them, it is said, to attend to their duties." The Cheezhoo replies, "O grandfather, it is well!" Then he says to all, "O comrades, to-morrow I will cause you to attend to your duties!" This ends the ceremonies and proclamations for the night.

On the second day the Cheezhoo men precede the Hañka men in every rite, one of their number being the master of ceremonies for the day. On the previous evening members of the Dhu'-khe sub-gens of the Buffalo-bull gens brought in bunches of dried willow, which were laid out of sight by some of the men on the Hañka side. Before daylight, on the second day, all the men arise, and the men of the Night gens (who are a sort of bear people) set the willows afire; while the fire burns, long prayers are made by the men of the Night and Elder Osage gentes. At the end of a song they see who can get some of the fire. In the struggle which ensues the pieces of willow are crushed to pieces. This act has a special name. What charcoal each one gets is saved till the return to camp. The charcoal symbolizes the enemy. On their return to camp each warrior goes to his place and mixes the sacred charcoal with ordinary charcoal, after which he paints himself. Those who desire go and sing around the village. After breakfast they dance around the village all the morning, as on the first day. Then they have another feast at about noon. They dance the circle and bravery dances, as on the preceding day. At night, just before retiring, one of the Cheezhoo lieutenants calls to those on the other side. A Hañka lieutenant replies, "O my grandchild! what is the matter?" Then the Cheezhoo says what the Hañka did on the previous night, and the Hañka speaks the words used on that occasion by the Cheezhoo.

On the third day the Hañka men precede the Cheezhoo men in every rite, as they did on the first day, and one of their number acts as the officer of the day. The sacred bags of a large war party are brought in, one by a Wa-zha-zhe or Osage man for

the Hañka side, and one by a member of the Lock-wearer gens for the Cheezhoo mourner.

They dance as on the preceding days. The Hañka mourner tells the Cheezhoo that on the morrow they will take the first step.

On the fourth day the Cheezhoo men lead in every rite, as they did on the second day. Two narrow strips of buffalo hide are prepared by an old woman of a Buffalo gens on the Hañka side of the circle. These strips are placed side by side on the ground, and about two feet apart. The Cheezhoo men place their left feet on the rear one, and their right feet on the front one. The Hañka men have their right feet on the rear one and advance with their left feet on the front one. This is the first step taken on the war path.

The warriors now mount their horses, forming in two columns, in each of which they go two abreast. The standard-bearers ride in advance. The Cheezhoo column goes once around the village, in the usual course from the west to the north, thence by the east and south to the west again. The Hañka column proceeds in the opposite direction. They approach one another again at the west, and depart westward in parallel columns (Fig. 7). Their course on the war path is supposed to be towards the west. When they have gone a certain distance from the village a member of the Dhu-khe sub-gens of the Buffalo bull gens is taken to the front, where he performs a rite. At its conclusion the march is resumed, and they continue on their journey for about four days, at the end of which period a small tent is erected for each captain or mourner, the door facing the west. Each eagle is removed from the sacred bag and placed on top of the small tent (on its proper side), facing the west. Each captain goes through his tent from east to west, knocking down the tent, and causing the eagle to fall to the ground. The eagle is restored to its bag. Then all the warriors except the captains,

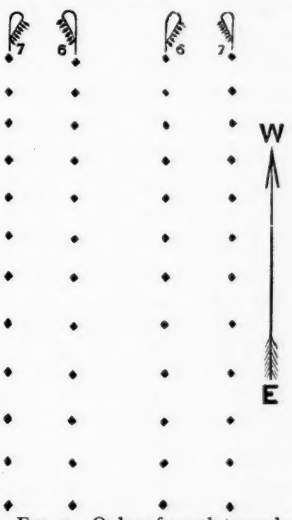

FIG. 7.—Order of march towards home.

lieutenants and heralds can swim and wash their faces. They resume their march, and by and by they meet a foe whom they attack. Let us suppose that they kill him. The first man who strikes him gets the first honor, and the second honor is given to the next who gives a blow. The scalp is handed to the Hañka captain, who gives it to the Cheezhoo captain, saying, "Here is that for which you employed me." The corpse is laid with the head to the east. The Hañka captain makes a hole on the right side of the chest into which is thrust the standard with seven feathers of the Hañka men, the feathers pointing to the west. The Cheezhoo makes a hole on the left side of the corpse into which is stuck the principal Cheezhoo standard. The second Hañka standard-bearer places his standard, with six feathers, between the right arm and the chest; and the second Cheezhoo standard-bearer puts his between the left arm and the side.

Should they lose one of their own men at this place, they set up the body against a tree or bank, using most of their paint in painting him all over. They break four arrows which they lay by him, and they leave some paint there. After mourning over their own dead, they will mourn for the foe just as if he was a friend. At certain intervals (answering to every two or three hours, as we reckon time), the standard-bearers tell the captains to command the warriors to mourn. Before they reach home all the trophies, including the scalps, are placed on a pole, at which they charge, firing four times at it.[1]

When they have lost one of their party they neither eat nor drink till they have poured out food and water for the dead. When they come to a post oak they strip it of the bark for about five feet from the ground; they paint the tree red, break four arrows and leave them by the tree with some paint.

When they approach the village, they cannot enter it if they have lost any of their party; but they must stop, in that case, about one or two hundred yards from it. The principal man of

[1] A similar custom is practiced by the Dakotas when they cut down the pole for the sun dance; and the Omahas and Ponkas charged on the tree ere they cut it down for their sacred pole, more than two hundred years ago. The Omahas said that their pole, on that occasion, represented an enemy, and a scalp was put on its head in accordance with that notion. A race for a tree also occurs when the Omaha young men go to cut down one for the dance after the thanksgiving for success in the buffalo hunt. Further investigation of this custom may reveal other interesting facts.

the Kansas gens knows what is meant. He puts on a robe made of bear or buffalo skin, and advances toward the party, with his kettle-bearer, till he can hear what they say. He begins the conversation by asking them what is the cause of their halt. Then he tell them the news from the village. After this he approaches the warriors, going around them, and performing a rite, first at the north, then at the west, south and east. Next he addresses the Hañka captain, then the Cheezhoo captain, telling whether they can enter the village.

Having gained his consent, they leave all their blankets and other clothing, as the pay of the old man and his servant. But they retain their weapons. They are met by some of the people, who give them other garments. Then the warriors separate. The tents *A* and *B* are thrown down, and the war tent, *C*, is set up again at the west.

The final ceremonies are the scalp dance, captive dance (?),[1] dance in which they take the standards, and the trial over the sacred bags. One of the captains may select any one of the three dances to the exclusion of the others, or he may have two without the standard dance; but the trial over the sacred bag is never omitted.

The scalp dance.—Previous to this dance, the captain of one side gives a horse to his principal kettle-bearer, who sells it for the food needed at the feast which precedes the dance. The standard-bearers dressed in their finest attire, notify all the women in the village: "We wish you to come and dance this afternoon." Then the two captains go around the village, saying, "Ho, my little sisters! my comrades! it is said you must pity me!" Each captain walks around the village according to the side of the circle in which he camps, and each woman in dancing remembers this rule.

After the women have been called by the captains, the former strip to the waist, covering their bosoms with pieces of cloth or calico. They pretend to be men, decorating themselves with feathers, paint, etc. They are led by one who carries the scalp on its pole. She is chosen for that purpose by one of the captains. Some women carry bows, others take arrows, some have war pipes, and some carry peace pipes. The drummers sit in a small circle around the pole. A great warrior arises and tells of his ex-

[1] Takdhe watsiⁿ, in Osage. Its translation is doubtful.

ploits. Then the drum beats, and the women dance. All start together, the women of the Cheezhoo gentes moving in one direction, and those of the Hañka gentes in the other, around the pole. The successful warriors who are mounted, come in their war dress, and gallop around the pole, close to the women, telling of their deeds. This dance is continued for about half an hour. The trial or ordeal of the sacred bags must follow on the next day, unless a captain wishes to have the captive dance, in which event it follows.

The captive dance.—A war captain gives another horse to his chief kettle-bearer, who sells it for the food required for feasting the guests before the dance. The standard-bearers and captains go around the village, as on the preceding day, and the women come, as before. The drummers sit around the pole. The dancers are led by two men abreast. These used to be men that had gone to war afoot. They are followed by two women, then two men, then two women; and so on. Those who went to war mounted come to the dance on their horses. One of the principal men tells his story first; and the horsemen tell their deeds as they gallop around the dancers. The dance lasts for about half an hour. But if the captain prefers, he may substitute the standard dance for the captive dance. But if the latter is chosen for the second day, and the captain wishes to gain more honor, he gives another horse to his chief kettle-bearer, to be sold for food for the feast that is held before the Standard dance on the third day.

The Standard dance.—The standards are made like those used at the beginning of the expedition, and they are given to the standard-bearers, who dance around the village, two abreast, all going in the same direction, followed by the other warriors. Having gone around the village, they assemble at a short distance from it and have the circle dance and bravery dance, as at the first. This ends the dancing for that day.

The Trial over the sacred bags.—The old men assemble in the war tent, *C*. The sacred bags are brought in to test the warriors, who are watched very closely by the old men. All the old men who have been distinguished in war are painted with the decorations of their respective gentes. That of the Cheezhoo peace-maker gens is as follows: The face is first whitened all over with clay; then a red spot is made on the forehead, and the lower part of the face is reddened. With his fingers, the man scrapes off the white clay,

forming the dark figures by letting the natural color of the face show through. (See Fig. 8.)

Each warrior has four sticks about six inches long, to be laid in succession on the sacred bag. The warriors are taken in the following order: First, the captains, next the lieutenants; then the heralds; after whom is the man who struck the first blow; then he who hit the second blow; and so on.

As each captain lays his first stick on the bag, he says, "Ho, O grandfather! I lay this down on you because I am one who has killed a man." On laying down the second, he says, "Ho,

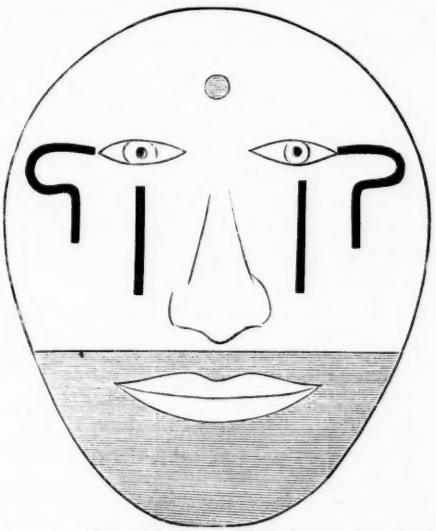

FIG. 8.—Decoration of the Tsicu Wactake or Cheezhoo peace-maker gens.

O grandfather! I wish to be fortunate in stealing horses! I also wish our children to be as fortunate as we!" When he puts down the third, he says, "Ho, O grandfather! I wish to raise a domestic animal. I wish to succeed in bringing it to maturity." By this he means a son. The prayer when the last stick is laid down is as follows: "Ho, O grandfather! May we continue a people without sustaining any injuries!"

Similar petitions are made by the lieutenants and heralds. He who gave the first blow says, as he lays down the first stick, "Ho, O grandfather! I lay down this on you as one who has caused another to stun a foe!" The rest of his petitions are those of the

captains and other men. He who struck the second blow, says as follows, on laying down his first stick: "Ho, O grandfather! I place this on you because I was the next one to strike and stun a man!" The other petitions follow, as given above. The first petition of each of the remaining warriors is as follows: "Ho, O grandfather! I lay this on you as a token that I have aided in overcoming the foe! (A provisional translation, as the writer is uncertain as to the exact rendering of "wa-yü-khpe," which, judging from the meaning of the root *khpa* and *khpe* in cognate languages, implies *pulling down a foe.*)

At the conclusion of this trial, the warriors rub the paint off, and wash their faces, thus ending the war party.

II. Sacred Bag War Party.

A man mourns alone, putting mud on his face. He comes into the village, and selects a man for his first kettle-bearer, who builds for him a small lodge apart from the village. The mourner retires to this lodge, and keeps away from the women. He sends his servant, the kettle-bearer, for two men, one on the Hañka side of the tribe, the other on the Cheezhoo side, to act as standard-bearers. When they come to him, he informs them whither he wishes to go, and for what purpose. The three depart to invite the warriors. Those who are willing can join the party. The mourner has a pipe and tobacco, also a sacred bag made of the skin and feathers of a bird, given him by his teacher, one of the old men belonging to the secret order.

The servant cleans out the pipe bowl, which is filled by the mourner. The latter hands the pipe around the circle of guests, beginning with two standard-bearers. Last of all the mourner smokes. As he hands the pipe to each man, he says. "Grandfather, I ask an animal of you." The reply is, "Captain, you shall have your desire."

All march a short distance from the village. A small fire is made. The teacher performs a ceremony over the mourner, and then makes him take the first step on the war path, as has been shown in the account of a large war party. Then the old teacher departs to the village. The warriors march on. When they meet a foe, he who strikes him has the first honor, the second who hits him, cuts off his head. The honor of killing him belongs to the captain or mourner, whether he is the actual slayer

or not; and the whole scalp is his. When they turn back, they hasten homeward. Before they reach home, the scalp and other trophies are fastened to a pole, charged on and shot at four times.

When the warriors get near the village, they use charcoal for painting their faces and the scalp. The young kettle-bearers make this charcoal, using willow if they can find any. Then follow the ceremonies accompanying the cutting off the under skin of the scalp. The captain stands facing the east, and if he is a member of a gens on the Cheezhoo or left side of the tribe, he holds a knife in his left hand. If he belongs to a gens on the Hañka side, he holds the knife in his other hand. Holding the scalp in

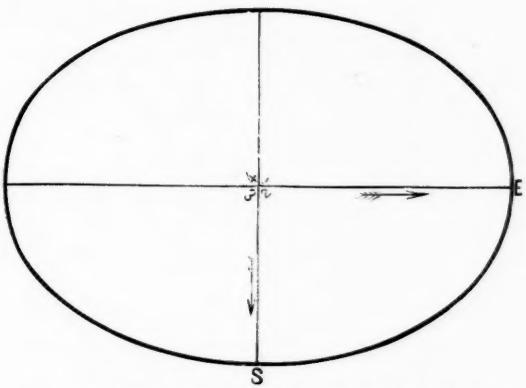

FIG. 9.—Showing how the scalp is prepared for the pole.

one hand, with the other he places the blade across it, with the point towards the south. (Fig. 9.) Then he turns it with the point toward the east. Next, with the blade resting on the scalp, the point to the south, he moves the knife backward and forward four times, cutting deeper into the scalp on each occasion. Then he makes four similar cuts, but with the point to the east. After this, the flat part of the blade being on the scalp, its edge is put against one of the four corners made by the previous incisions (1, 2, 3 and 4), beginning with No. 1. He cuts under each corner four times, singing a sacred song each time that he changes the position of the knife. All of the under skin is cut loose by this time, and is thrown away. The scalp is stretched and fastened to a bow, which is bent and formed into a hoop. This hoop is tied

to a pole that is carried by the principal kettle-bearer. (See Fig. 10.)

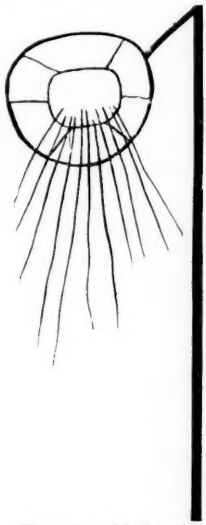

FIG. 10.—Mode of mounting a scalp.

On reaching the village, they charge around it, shouting and giving the war whoop. Such of the old men as have been warriors go out to meet them, asking who was the first to strike a blow, who cut off the head, etc. On learning these things, those old men who struck foes when they were younger, say in a loud voice, that all the people may hear, "As I struck a foe, such a one (naming him) has done so too!" Others say: "As I cut off the head of a foe, such a one (naming him) has done so too!" Then follows a feast, after which comes the dances which have been described.

During the trial of the warriors over the sacred bag, the affirmations and petitions resemble those used by the members of a large war party, with only one exception. The man who cut off the head of a foe says, when he lays down his first stick, "Ho, O grandfather! I lay this down on you as one who has broken off a head."

III. HORSE-STEALING EXPEDITION.

This can be undertaken at any season. There are as many captains as may wish to join the party. Each one of them is a mourner for dead kindred, or for stolen property.

When men wish to steal horses from the enemy, they paint their faces with charcoal.

On such an expedition the customs resemble those of the other parties.

GENERAL REMARKS, APPLICABLE TO ANY WAR PARTY.

Before attacking the foe, the warriors paint themselves anew. This is the "death paint." If any man dies with this paint on him, the survivors do not put on him any other paint.

All the gentes on the Cheezhoo side use "fire paint," which is red, applying it with the left hand all over the face. They use prayers about the fire, saying, "As the fire has no mercy, so should we have none." They put mud on the cheek, below the left eye, and as wide as two or three fingers. On the

Hañka side, they put the mud on the right cheek below the eye. This is the young buffalo-bull decoration. With reference to it, a man says, "My little grandfather (the young buffalo-bull) is always dangerous as he makes an attempt. Very close do I stand, ready to go to the attack!" The horse is painted with some of the mud on the left cheek, shoulder and thigh, if his rider belongs to the Cheezhoo side, but the mud is put on the right cheek, shoulder and thigh of a horse belonging to a warrior on the Hañka side.

Some warriors, who act like a black bear, paint with charcoal alone. (The tradition of the black bear people is, that they brought down fire from one of the upper worlds.)

Some paint in the wind style, some in the lightning style, and others in the panther or catamount style.

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NOTES ON SOME APPARENTLY UNDESCRIBED INFUSORIA FROM PUTRID WATERS.

BY DR. ALFRED C. STOKES.

FROM a dead rat which had been lying exposed to the weather for an unknown period, but long enough to have had most of the abdominal soft parts destroyed, the tail was taken and placed to macerate in ordinary river water as supplied the town by hydrant. By the third day the infusion teemed with minute life, an apparently undescribed Heteromita, which at first glance was mistaken for *H. caudata* Duj., being particularly abundant. A careful examination, however, discovered so many essential points of divergence between it and known forms that it seems to demand recognition as a presumably new species, under the name of *Heteromita putrina* (Figs. 1 and 2).

H. PUTRINA, n. sp.—Body obovate, wider and rounded anteriorly, tapering posteriorly to a somewhat obtuse point; surface smooth, endoplasm enclosing several dark bordered refractive particles; nucleus obscure, apparently centrally placed in the median line; contractile vesicle conspicuous, situated near the right lateral margin of the anterior body half; the vibratile flagellum but slightly exceeding the body in length, the trailing gubernaculum about three times as long as the zoöid, both being of equal size and inserted anteriorly. Length of body $\frac{1}{3000}$ to $\frac{1}{4500}$ inch. Habitat, the putrid water of animal macerations.

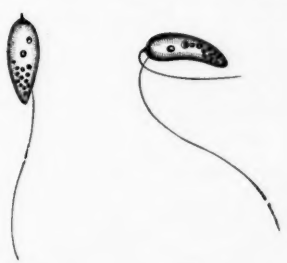

Fig. 1. Fig. 2.
Heteromita putrina, n. sp. × 1500.

The creature, when in a healthy or comfortable condition, is very slightly if at all changeable in shape. When about to die it takes a sub-spheroidal form and becomes diffluent, but this stage is at times postponed until the animal has passed a short period as a granular amœba, with a large and conspicuous contractile vesicle, slowly moving by a forward flow of a sarcode wave unaccompanied by the posteriorly located granules. The motion of the Heteromita when swimming is rapid and oscillating, being a forward movement by short zig-zags, the animal at the same time rotating on its longitudinal axis.

The anterior vibratile flagellum is ordinarily extremely difficult to detect. The zoöid, when attached, rests at the extremity of its anchoring flagellum, and when viewed dorsally the vibrating lash is visible for only the very short distance between its origin and the point where it curves to pass beneath the lower or ventral surface (as in Fig. 1), this part being flexible but apparently not vibratile. Even when in a favorable position for its own demonstration, the rapidly-moving filament becomes visible only after careful manipulation of the mirror, or after the infusorium has been killed by iodine or osmic acid. Small particles are not affected by its motion until they have floated past the anterior margin of the body, sometimes almost in contact with the surface, when they fall into the stream and are dashed upward, at times performing a complete circuit around the animal to the starting point. If solid food is taken, which I doubt, it must enter through the ventral surface. No solid particle has been seen to pass into the endoplasm, although I have tried to feed the creatures with indigo, and have had the same individuals in a growing-slide for four full days surrounded by myriads of bacteria.

The contractile vesicle pulsates quickly and sharply once every nine seconds. The only method of reproduction observed is by longitudinal fission. The species here referred to is remarkable for its stability of form and for the position of its tractellum or vibrating flagellum, the latter peculiarity having been recorded for no other member of the genus.

In the same animal maceration, as the Heteromitæ were disappearing, many ciliated infusoria were developed, which, according to the latest schemes of classification, can be relegated to the genus Tillina only, although, so far as external contour is concerned, the resemblance is remote. This difference of form, how-

ever, in connection with certain points of structure, compels its addition to the rapidly increasing list of new American species, while the possession of a pharynx from which spring rows of vibratile cilia, at once forces its admission into the above-mentioned genus.

The likeness of the hitherto single known species, *Tillina magna* Grüber, to Colpoda, has been remarked by its discoverer, but the resemblance between the latter and the form here referred to as *Tillina saprophila*, n. sp., is even more conspicuous than with the type, and would necessarily place it in the genus Colpoda were not the pharyngeal series of cilia present. These cilia are apparently larger but much shorter than those of the general cuticular surface, which are long and very fine. They are with difficulty separately resolved by the objective, unless the infusorium is in a weakened or dying condition; otherwise their motion is incessant, and they themselves become visible only through their effect. They depend from the entire internal surface of the membranous pharynx, projecting slightly, if at all, beyond the oral aperture. The cilia of the general surface are extremely fine and, like those in the pharynx, can be satisfactorily distinguished only when the animal is quiescent, those situated anteriorly then showing themselves to be somewhat the largest. The body is grooved obliquely, the striations being especially distinct on the anterior body half. The circular oral aperture is placed in the center of the ventral surface and, as the infusorium is swimming at ease, appears to be lateral. It is followed by the short membranous pharynx curving toward the posterior extremity of the zoöid and bearing the vibratile series already referred to. The endoplasm, usually colorless, encloses several linear straight or slightly curved dark-bordered bodies, and numerous small corpuscles which at times render the body semi-opaque. The nucleus is large and situated near the center of the dorsal region, commonly opposite, occasionally slightly in advance of the pharynx and oral aperture. The contractile vesicles increase in numbers with the creature's age. In early youth the pulsating vacuole is single and postero-terminal; when the Tillina is mature, or nearly so, two, three or even four, posteriorly placed, are not uncommon. When single, pulsations take place about four times a minute.

Reproduction is accomplished by encystment followed by spore formation and by fission into two or more zoöids, the young in

the latter event differing in form so conspicuously from the mature animal that, before the life-history had been traced, they were mistaken for another species and described as such in manuscript. The act is performed without immediate conjugation; whether in the instances observed there had been a remote union, I of course do not know.

Individuals have several times been so accommodating as to enter the field of the objective just before the beginning of the first stage in this reproductive act, thus affording me an opportunity to follow the changes with ease. The body is soft and flexible, but, except immediately prior to encystment, is not changeable in shape. At that time, however, the animal assumes a spherical form, and prepares a cyst so delicate and transparent that ordinarily it is invisible after its evacuation; but occasionally it collapses as an indescribable exuvium containing several bright bubble-like spots, and becomes for a very short time slightly

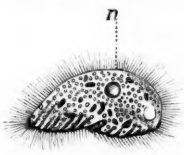

Fig. 3.

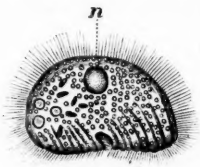

Fig. 4.

Tillina saprophila, n. sp. FIG. 3.—Immature form, × 960. FIG. 4.—Mature infusorium, × 750.

amœboid. Fission is accomplished within this sac, and I have in one or two instances observed a binary division without the formation of an enclosing membrane; but in every case it seems that the divided surfaces become the ventral. The process, at least when four zoöids are the result, consumes about two hours from the assumption of the spherical form. The young force their way from the cyst through a small opening visible only in its effect upon the shape of the emerging creatures. A small knob-like projection first appears, and as the animal urges itself through the aperture, a narrow and sharply defined constriction passes successively over the whole length of the body, each of the little animals emerging through the same opening. The young and the old differ, as shown in lateral view in Figs. 3 and 4, the latter being the mature form, in which the dorsal surface, as seen in profile, is much more strongly and evenly convex, and the ventral more flattened, than in Fig 3. In the infusion, forms intermediate

in shape and size are abundant. The length of the zoöid immediately after emergence is $\frac{1}{1000}$ inch, at maturity, $\frac{1}{750}$ inch.

The species seems to be not very susceptible to the deoxygenation of the water, thriving and multiplying where more sensitive infusoria would soon die. But when the supply of oxygen becomes too limited for even its small demands, the second form of reproduction, that of sporular subdivision of the entire body takes place. The zoöid assumes a spherical shape as before, but now prepares a distinct and substantial cyst in which the subdivision is accomplished. I have witnessed the formation of these cysts in very many instances, the completion of the process once only. The cyst wall was then suddenly ruptured and the motionless and finely-divided contents thrown out by the collapsing sac, but to my regret were almost immediately lost amid the surrounding clouds of bacteria.

The movement of the infusorium when first placed on the slide, is rapid and erratic, with rotation on the longitudinal axis; when quieted it is irregularly forward, or in wide circles, usually with one or the other lateral surface downward, thus placing the oral aperture, as already mentioned, apparently upon the side. The following may be taken as a description:

TILLINA SAPROPHILA, n. sp.—Body flexible, obliquely grooved, subreniform or bean-shaped in profile, length once and one-half to twice the width; when viewed dorsally, ovate, wider and somewhat inflated posteriorly, tapering and pointed anteriorly; size and dorsal convexity increasing, the ventral concavity lessening with age, thus giving the mature animal an almost semicircular outline when seen laterally; cuticular surface entirely ciliate, the cilia somewhat larger anteriorly; oral aperture circular, placed centrally in the ventral surface and followed by a short, recurved, membranous pharynx entirely ciliate within; endoplasm enclosing colorless corpuscles and dark-bordered linear bodies; nucleus spherical, dorso-central; contractile vesicles several or single, posteriorly situated; anal aperture not observed. Length of body, $\frac{1}{1000}$ to $\frac{1}{750}$ inch. Habitat, the putrid liquid of animal macerations made with water from the Delaware river.

This species conspicuously differs from *Tillina magna* not only in form and size but in the possession, by the latter, of a posteriorly-developed lobate process, an elongate-ovate anteriorly-placed nucleus, a single contractile vesicle and a larger pharynx.

From an animalcule to a Chinaman is a great leap, and one that mother nature would take longer to make than the writer is at present taking. But Charlie Lee is a genial little Chinaman who now keeps a laundry and sleeps on a shelf, who intends, when he returns to the Flowery Kingdom, to have "a big blick house with tlees in flont." He has started a new "craze" in this

town by the introduction of a Chinese narcissus, whose pretty blossoms are brightening many a front window, and perfuming many a room with their delicate fragrance. Charlie's cultivation of the plant is much like our winter culture of the hyacinth, only he thinks it necessary to surround the bulbs with many stones and pebbles, and to bind together the leaves with a strip of red paper, which gives them quite a military aspect. Several of the outer onion-like layers of these bulbs were put to soak, and the result awaited. My pleasure in this result was to be slightly dashed with bitter. The infusion swarmed with what a friend called "heathen dragons," but the dipping-tube occasionally brought up a fragment bearing a sedentary collar-monad, a Monosiga, which, under other circumstances I would have been glad to see. Members of the Choano-Flagellata have become favorites of mine, and I have learned to associate them with especial purity in their surroundings; so to take them from this brownish, mucilaginous and malodorous liquid, was it not the fall that is said to always follow undue pride? This alone, however, would scarcely have upset my equilibrium. There is a little more. The creature was one that had seemed particularly graceful, and I had described it as new in the *American Monthly Microscopical Journal* for Nov., 1883, naming it *Monosiga Woodiæ*, after a friend. How did it get into this undesirable predicament? Had its quiescent germ been clinging to the bulb from China land? Had it been swinging in the air of Trenton, or had it been floating in the water of the Delaware? Who can tell?

With it *Goniomonas truncata* Fres., whose habitat is said to be "fresh water," was present in profusion, its numbers increasing rapidly by longitudinal fission, and a Tillina, differing so markedly from the form in the rat-tail maceration that it must be regarded as a new comer among known infusoria.

The latter Holotrichous creature, represented in Fig. 5, is so peculiar in form that I hardly know how to characterize it except by saying that it is somewhat mitten-shaped, although its resemblance to that ugly hand-protector is rather distant. Neither kidney nor bean ever possessed that posterior enlargement which gives the animal its curious mitten-like contour, and which makes *inflata* a suitable

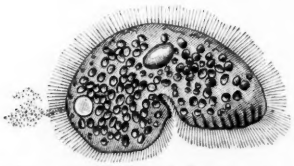

FIG. 5.—*Tillina inflata*, n. sp., × 560.

specific name. When viewed dorsally, consequently in transverse optical section, the body is ovate in outline. In its lateral aspect, as is shown in the figure, it exhibits a superficial differentiation into an anterior narrower body-half and a rounded, very conspicuously widened and inflated posterior portion. When mature it measures $\frac{1}{486}$ inch in length, $\frac{1}{750}$ in. at the widest part of the posterior body half, and $\frac{1}{1000}$ in. at the greatest width of the anterior portion.

The surface is obliquely grooved, apparently in two directions, this double striation being much more conspicuous in the young, as is also the case with *Tillina saprophila*. In color it is a deep amber. The tint varies in depth, however, changing with the color of the infusion and, to a certain extent, with age, the young usually being paler than the adults. The granulate endoplasm encloses many large granular corpuscles, seemingly formed of agglomerated food particles, almost as abundant in those just escaped from the cyst as in the older animals. The large ovate nucleus is located above the median line near the center of the dorsum. The single contractile vesicle is situated close to the posterior extremity and to the right. It pulsates, as in the preceding species of the genus, once each fifteen seconds. The anal aperture seems to be rather indifferently placed either above or below the pulsating vacuole. But I may have misinterpreted this, as its appearance is always sudden and unexpected, the animal being in rapid movement at the same time, and the contractile vesicle probably collapsed and invisible. The ovate oral aperture is placed obliquely near the center of the left lateral margin of the ventral surface. The succeeding rather capacious but short and slightly recurved pharynx is entirely ciliated, the cilia being of course shorter, but apparently much coarser, than the long fine vibratile hairs of the cuticular surface. To actually see the individual pharyngeal cilia is no small matter, demanding no slight amount of patience even after the restless creature has been cornered; their seemingly greater size may therefore be illusory both with this and the preceding Tillina, as I have in no instance been able to see them in the recently-killed infusorium, while those of the cuticle are then readily resolved.

Its movements resemble those of *T. saprophila*, the creature floating upon one side, usually the left, when quietly feeding on the bacteria that seem to be a favorite food. When these plants are

abundant they are swept through the pharynx and into the body in a strong stream, the animal having sufficient intelligence to know and to reject what may be unpleasant or non-beneficial. With indigo it refuses to have anything to do; and a particle of any kind that may be too large, or otherwise unacceptable, scarcely passes the oral aperture before the current is reversed and the disagreeable substance dashed out.

Reproduction with the form referred to as *Tillina inflata*, n. sp., is accomplished, so far as I have observed, by encystment and subdivision of the body into four zoöids, which differ from the adult in no particular, except in their smaller size.

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COLONIAL ORGANISMS.

BY CHARLES MORRIS.

THE remarkable resemblance which appears between the separate segments of an Annelid, the distinct units of a Hydrozoan, or in the sectional parts of other forms of the animal and vegetable kingdoms, is one that admits of two interpretations, and has in consequence given rise to two opposed theories. In the first, supported by several eminent scientists, it is assumed that each unit or segment represents an original individual, and that the existing individual arose through the subordination of the members of an original colony. In the second, supported by equally eminent authorities, it is assumed that the organs of an original individual gradually took on the form and functions of the parent body, and thus, though originally diverse in function, grew to closely resemble each other.

This latter theory, which is based on the assumed tendency of each cell or other portion of an organic form to develop into an exact reproduction of that form, is supported by Huxley, Van Beneden and other biologists. The opposite theory, which is based on the apparently direct indication of the facts, is sustained by Allman, Gegenbaur, Claus, Lankester, the Hertwigs, &c. Late discoveries seem to sustain the colonial rather than the individual theory. The probable fact is, however, that they are both, to a certain extent, true, and that both the colonizing habit and the reproductive power of single cells have had their share in the formation of the closely similar sections of Hydrozoan and Annelidan individuals.

It is proposed here to offer a general consideration of the subject in its application to both the vegetable and animal kingdoms, and mainly from the colonial point of view, though with full acknowledgment of the tendency of the generalized parts of an organic body to assume the form of the whole, and the power of each unspecialized cell to act as a reproductive germ. It is quite possible that some new arguments may be advanced, and the whole subject be placed in a clearer light, since, so far as the writer is aware, no complete treatment of it has been yet attempted.

Organic forms are reproduced in two methods: by asexual and by sexual generation. The first, the development of unfertilized germinal cells, is the most common in the lowest forms of life. The second, the development of fertilized germs, or of germinal cells into whose composition enters material from two separate individuals, gradually replaces the first as life attains a higher grade, and completely replaces it in the highest forms. In connection with this is another fact of importance here. The products of asexual reproduction very commonly remain attached to the mother form, and compose colonies. The products of sexual reproduction never remain attached, but always enjoy a free existence. This distinction is markedly displayed in vegetable life, in which the product of the leaf bud continues, with few exceptions, attached to the parent form, while the product of the flower bud is always set free, to give rise to a new parent stock.

There is reason to believe that generalized cells, capable of reproductive development under proper conditions, exist abundantly in every part of every organism. In all the higher animals, if the views advanced by the writer in a preceding paper[1] be correct, these mainly exist in the blood current, as the amœboid white corpuscles. In many of the lower animals, in which specialization has made no progress, most or all of the cells of the body possess this power, and reproductive budding may take place at any part of the organism, or if it be cut into minute portions, each of these may develop into a new individual. In vegetable forms the latter condition seems to prevail. In the lower plants every cell may be capable of asexual development. In the higher plants the process of specialization has taken this power from the great mass of cells, yet vast numbers of cells exist capable of germinal

[1] Organic Physics, AMER. NAT., July, 1882.

reproduction. We venture to offer the hypothesis that the meristem, or generalized active tissue, is made up of such reproductive cells, each capable of asexual development, or of being converted, through the medium of the flower organs, into sexual germs. If this be correct, the meristem cells of plants represent in their germinal powers the generalized tissue cells of the lower animals, and the wandering white corpuscles of the higher animals.

Abundant, however, as germinal cells may be in every part of every organism, yet only a limited number of them can develop since their growth acts to exhaust the strength and substance of the parent form. Only in the lower single-celled organisms do we find instances in which the whole body is converted into active germs, and the parent disappears in its offspring. In all the higher animals and plants this only partially takes place, and the less so the higher the organism.

The development of the germ cells usually occurs only at those points where favoring conditions most fully exist. In sexual reproduction these points are particularly limited in number, since the requisite meeting of germs from two organisms can only take place through the aid of a special mechanism. Asexual reproduction needs no such special mechanism, and may occur in most regions of the body. Yet, as life advances in grade, the favoring conditions of asexual development will be apt to exist more abundantly in some regions of the body than in others, and tend to become confined to these regions by hereditary transmission. In the higher plants these regions are usually the leaf axils, in which a degree of protection is afforded the bud, or partially developed germ. But if a tree be closely trimmed, and thus deprived of all its buds, new germs may develop at any point in the secondary meristem of the trunk or branches, and new shoots appear, the product of germinal cells which otherwise would have lacked the opportunity to develop.

In the development of the germs of the root fibers or shoots no such protection is requisite, and they may start from any point in the cambium layer. They are evidently the product of those meristem cells, which have been most successful in the general effort to develop.

The reason that certain cells alone succeed in developing, out of the great mass of cells that possess equal germinal powers, is

an interesting subject to which some further attention is desirable. As already said, each developing cell to a certain extent exhausts the organism and checks the reproductive activity of other cells. What is the principle of selection of these fortunate cells? It would seem as if they must possess superiority in nutrition, or be most favorably situated for assimilating nutriment from the vascular juices of the organism. Thus growing rich in protoplasm, their effort to develop must be not too greatly hampered by the crowding of surrounding cells. They must have some freedom of field in which to expand. The cell most favored in these particulars will be the most likely to develop. As for the germ cell of sexual reproduction, it possesses these requisites in a high degree. It develops in a region which is richly supplied with nutriment, and where there is no hindrance to its expansion. Of the many cells delivered into this region it would seem that those richest in protoplasm should, all things considered, have the best chance to develop and become the germs of new organisms. In sexual development, however, there must enter a certain element of chance, since the meeting of ova and spermatozoa is, to some extent, a matter of chance, and the earliest fertilized ova probably have a degree of advantage over their rivals.

With these preliminary remarks we may proceed to the consideration of the colonizing habit as usually displayed by the products of asexual generation. Colonial organisms occur abundantly in the single-celled field of life, as in the Diatomaceæ, the Volvocineæ, the Foraminifera, the Radiolaria, the Flagellata, &c. In the multicelled field it is indicated throughout the vegetable kingdom, and in the Spongida, the Hydrozoa, the Actinozoa, the Polyzoa, the Ascidia, the Annelida and the Arthropoda of the animal kingdom. But these indications of colonial origin are by no means all equally distinct, and in some of the sub-kingdoms mentioned they are but vaguely discernible. Yet there is a gradual movement from the less to the more questionable colonies which is significant of a common origin.

In the colonies of Rhizopod and Flagellate Protozoa no traces of differentiation appear. Each individual is like all the others, and each is capable of separate existence. We cannot, in any proper sense, consider these colonies as compound individuals, though in the Foraminifera there is a slight tendency in that direction. This tendency is more markedly displayed in the

Volvocineæ, as we shall show farther on. It will suffice to say here that these colonies are the product of continued asexual reproduction, and of the coherence of individuals thus produced.

Of colonies of Metazoa those of the sponges are similarly the result of asexual reproduction, are unattended by specialization of any members of the colony, and their members may be separated and pursue individual lives, and produce new colonies. The sexually generated sponge, on the contrary, begins life as a free individual.

But the subject of the sponge leads us deeper into the question of reproduction. As is well known there are two hypotheses extant in regard to the classification of the individual sponge. In the one it is viewed as a colony of Flagellate Protozoa. In the other it is viewed as a single Metazoan. The former hypothesis is based on the cellular organization of the sponge, since most of the cells of its epidermal layer are essentially Flagellate Infusoria. The latter is based on the character of its reproduction, since the germ develops in Metazoan fashion and not by a process of colonization.

It has been assumed that these hypotheses are mutually exclusive, and that only one of them can be true. Yet this does not necessarily follow. They may both be true. The strong argument which each advances may perhaps be reconciled by a third hypothesis, or by a fuller consideration of the essential character of reproduction.

The assumption that a compound organism which is born as a single cell, and grows by asexual budding, is a Protozoan colony, and that one which is born as a definite compound of cells is a Metazoan individual, has its uses for purposes of classification, but it declares a distinction that has no real existence. If we consider birth in its true relations, all organisms are born as single cells, and their complete development takes place after birth. For birth really occurs at the moment in which the germinal cell ceases to be a part of the parent organism, and begins its individual life. Whether it is delivered directly into the surrounding elements, or into an ovary within the maternal body, the essential fact remains the same. It has ceased to be a constituent part of the maternal body. It occupies an external locality, either in the exterior world or in a cavity communicating therewith, and

its nutrition and growth have become distinct from those of the mother. The only discoverable difference is that in the one case the nutriment is obtained independently of the mother, in the other case it is for a time provided by the mother.

The phenomena succeeding birth are the same in both cases. Continued division of the germ cell takes place and a mass of cohering cells is formed. It is true that in the cases where this takes place within the ovary or the egg a definite form is assumed. But the same is the fact with the Foraminifera, the Radiolaria, the Fungi, and the other colonial organizations which arise exteriorly through the continued subdivision of a germinal cell. There is no essential distinction between the two processes. The only visible distinction is that in the one case all this subdivision takes place exteriorly to the maternal body, in the other a greater or lesser portion of it takes place in a cavity of the maternal body which communicates with the external world, or within a capsular inclosure provided by the mother.

The distinction, therefore, between Protozoa and Metazoa is by no means absolute, and the highest Metazoan is essentially a colony of Protozoa, since it is born as a single cell, and gains its mature form by a long series of asexual cell productions. Its main distinction is that many of these new cells are greatly specialized, while in the simpler cell colonies they are to a great extent generalized.

The most primitive organic differentiation is into free cell and coherent cell individuals. Of the former there are numerous instances in the Protozoan world, yet at a very low level of life asexually-born cells begin to cohere into colonies. From these, at a higher level, arises the only distinctive feature of the primitive Metazoan life, that of the formation of organized cell colonies within the maternal ovary or the egg, precedent to birth into the exterior world. However different this process may appear from the formation of the simpler cell colony, the difference is only in seeming, and the enclosed embryo perhaps very gradually succeeded to the external colony.

The first significant step in this direction is taken at the low level of the Volvocineæ. The globular colony of Volvox in fact acts as a sort of womb, into which are born asexual germs. These develop into embryo colonies within the maternal body. We have here an instance closely analogous to that of Metazoan

birth, and a significant indication of the origin of the latter. The sexual offspring of Volvox, however, is born as a single germinal cell.

In the vegetable world the free cell colony assumes a size and complexity considerably in advance of any animal instances, for the Algæ and Fungi begin their external life as single cells. Thus, however large and complex they become, the process of growth is distinctly that of cell colonization.

There is one important fact observable in all cell colonies. They do not display varying and indefinite expansion, but tend to assume specific forms. These organisms are probably results of natural selection, and possess the forms best adapted to the life conditions of the colony, which forms are hereditarily transmitted. Now we may readily conceive, in the numberless fluctuations of nature, the appearance of circumstances to which the mature colony would be well adapted, but in which the germinal cell and the growing colony would be in danger of extirpation. Under such circumstances it would be a decided advantage if the germ could pass through its first stages of division within the maternal body, and a still more decided advantage if it could be retained under the maternal protection until sufficiently developed to be able to take care of itself in the battle of life. Such, possibly, was the method in which the Protozoan cell colony became the Metazoan organism, namely, by the retention of the germinal cell under the maternal protection until it had unfolded into a self-sustaining organism. The degree to which this embryonic growth proceeds differs greatly in different cases. In all cases the new creature is born as a single cell. In the Protozoan colony it is shed into the external world at this stage. In the Metazoan it is retained until it has passed through a portion or the whole of its development, or, more usually, is born as an egg, in which the germ rests in a store of nutriment provided by the mother, and enclosed within a protective covering. Only in the case of the Mammalia is the development completed before external birth.

Thus the division of the germinal cell, in the formation of the Morula, is in no fundamental sense different from the division of the amœboid cell, in the formation of a colony of Foraminifera. The Flagellate colony, from which there is reason to believe that the sponge originated, may, in the process of evolution, have

gained a somewhat complex organization, protected by fibrous and mineral secretions. Perhaps primitively yielding its germs as free cells, to develop into colonies externally, it may, in the exigencies of the struggle for existence, have come to retain them until they had developed into organized colonies, capable of self-support. Yet during the long period in which these gradual changes took place, the cells of the sponge colony continued to retain the characteristics of the Amœbæ and the Flagellata, so that to-day they display the double character of a colony of Protozoa and of a Metazoan individual.

We have dwelt at considerable length on this one case, as it involves the principle at the basis of all organic development. There is one other matter of interest connected with it to which we may here refer. The retention of the embryo within the maternal body, or within the egg, has an important bearing on the question of evolution. This latter retention is a true "acceleration of development."[1] The embryo, while thus retained, is specially favored in its growth. Provided with food without personal exertion, as in the case of free cell colonization, none of its energies are exhausted, and that organic development which is so greatly favored by complete rest proceeds rapidly. Its condition resembles that of the insect in the pupa stage, in which, supplied with abundant nutriment, and in a state of complete rest, organic development is rapidly attained. Such is the case with the embryo within the egg or the maternal womb. Its development is strongly accelerated, its larval stages passed through so rapidly that many of them are slurred over, and only the more marked stages are discoverable, and the new individual, when at length forced to depend on its own exertions, begins its free life at a much higher stage than in the case of the germ that is shed into the external world as a single cell, or a very immature colony.

If now we come to the consideration of Metazoan colonies, we find a gradual variation from simple to complex conditions closely analogous to the parallel case of cell colonies. Many of the colonies of the Metazoa are nearly as simple as those of the Protozoa. Such is the case with the Ascidia and the Polyzoa. These colonies are compounds of precisely similar, asexually-born individuals, each of which pursues life as an individual, though

[1] Cope. Origin of Genera. 1868.

they seem to possess some degree of vascular and sensory connection.

A somewhat more progressed case is presented by the Actinozoa, in which the colony is united by a common stem, which is fed by the united labors of the feeding individuals, and through which these individuals possess some degree of vascular, sensitive and motor connection. The separate members of the colony here take a first step towards reduction into the organs of a complex individual.

In the Hydrozoa this subordination is much more declared. Each member of the colony has lost a portion of its life powers, and is thus an incomplete individual. Some feed only, and have ceased to reproduce. Others reproduce only, and have ceased to feed. The colonial life is a necessity, since each individual has lost a portion of its life powers. From being individuals possessed of all the life functions, they have become organs of a composite individual, but organs which are as yet, in nearly a complete sense, individual animals. If now we consider the swimming Hydrozoan colonies, the Siphonophora, a remarkable development of this principle of subordination makes its appearance. These complex animals yield strong indications of an origin in colonies of individuals, which have become quite incapable of a separate life. Each has lost not one only but several of its organic powers, and is reduced to the performance of a single duty, while dependent on its differently-developed neighbors for aid in its other duties. The original individuals have become degraded into organs through this loss of ability and limitation of their field of labor. Thus, at the extremity of the general stem of the Siphonophora, there is usually an individual converted into a simple bladder, and useful only for purposes of flotation. Beneath it are a number of others which act only as swimming bells, their sole duty being to rythmically contract and expand. On the remaining portion of the stem are individuals, some of which act as food catchers, others as mouths and digestive organs, others are limited to reproductive activity, and others again are reduced to mere covering pieces, in which all the life organs have disappeared, and which seem intended merely to protect the more active individuals. The common connecting stem acts as a vascular system, and probably possesses some degree of sensory and motor activity.

In the Siphonophora, then, the reduction of a colony of budded individuals to the condition of a single composite individual has greatly progressed, so far as indications go. Their embryological development points to such an origin. In fact, the Hydrozoa generally are born from the egg as ciliated planulæ, which, after a period of free-swimming existence, become fixed and develop the mouth and tentacles of the Hydroid type. Only later the polyp buds sprout and the polypary is formed. Thus their embryological development indicates the character of their phylogenetic evolution.

(To be continued.)

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REVIEW OF THE PROGRESS OF NORTH AMERICAN BATRACHOLOGY IN THE YEARS 1880–1883.

BY W. N. LOCKINGTON.

IN this department little has been done in the direction of descriptive zoölogy—probably little remains to be done in the limits of the United States, while the researches of Sumichrast Bocourt, Cope and others, must have nearly exhausted the riches of Mexico and Central America in batrachian forms. Fortunately the batrachia are still, as they have been, favorite subjects with the anatomist and embryologist, and to this fact we owe much of the material presented in this article.

The most important addition to North American Batrachology within the two years to which we are confined is certainly that of M. Brocchi, forming one of the quarto numbers of the magnificent work which for several years has been published under the direction of M. H. Milne Edwards, by order of the Minister of Public Instruction, and entitled "Mission Scientifique au Mexique et dans l'Amerique Centrale." The part already published, though containing only the Raniformia and a portion of the Hylæformia, comprises descriptions of seventy species, eleven of which are new. The classification adopted is unfortunately that of Dumeril and Bibron. The primary division of the Anura is into Phaneroglossa and Aglossa. The former group is divided into Hylæformia, Raniformia, Hemiphractiformia (having teeth in both jaws), Bufoniformia and Hylapesiformia, the last section containing forms which are toothless like the toads, but are without the dilated sacral vertebræ of the latter. The Aglossa are

divided into Dactylethriformia and Pipæformia, the latter without teeth in the upper jaw.

The classifications of Günther, Mivart and Cope are reviewed, the character separating the Bufoniformia from the Hylapesiformia, and that dividing the Aglossa, are taken from Mivart, while the reasons given for the rejection of Cope's views are: 1st, the difficulty that arises, in practice, when a valuable specimen can only be correctly placed by its destruction in the search for characters drawn from its osteology; 2d, the length of time necessary for the complete ossification of the batrachian skeleton, so that, unless the specimen is adult, it cannot always be determined to which section it rightly belongs.

The first of these objections is well answered by Mr. G. A. Boulenger, in the introduction to the catalogue of Batrachia Salientia in the British Museum, already noticed by us in Vol. XVII, p. 181. In adopting Professor Cope's system, Mr. Boulenger says, "Very little skill is required to obtain the necessary information without serious injury to the specimen. Herpetologists have long been in the habit of making an incision in the skin of the pelvic region for the purpose of ascertaining whether the diapophyses of the sacral vertebræ are dilated or not; a slit made in the same manner along the thorax will show the sternal characters, and another (which can be sewn up again) along the side of the body, will suffice for the examination of the structure of the vertebral column."

M. Brocchi's volume is illustrated by ten well executed colored plates, in which the external and craniological characters of the newly described species are shown.

Among the new forms are *Rana vaillantii*, *Rana macroglossa*, *R. maculata*, *Leptodactylus fragilis*, *Hyla plicata*, *H. pœnulata*, *H. crassa* and *H. guatemalensis*. For the latter the new name, Camphias is proposed, but this is a synonym of the Hypsiboas of Wagler, as defined by Cope. There are some other synomyms among the Bufones and Hylæ.

Among the species described from Mexico the following occur also in the United States, according to Brocclin, *Rana halecina* L., *Scaphiopus solitarius* Holbrook, *Hyla regilla* Baird and Girard (Oregon, California), *Hyla versicolor* Harlan, *Hyla verrucosa* (Florida) and *Hyla cadaverina* Cope (Pacific Region).

Miss M. H. Hinckley (Proc. Bost. Soc. Nat. Hist., 1880) details

her observations upon the metamorphoses of *Hyla versicolor*. Eggs laid May 10th become frogs on July 4th. In two days after deposition all the ova were hatched, in four days the external gills were developed, in eight days the external gills were completely resorbed on both sides; and in seventeen days after deposition the hind legs commenced to bud, but the fore-legs did not both become free until about July 3d, by which time the edges of the tail were undergoing resorption. The tail in some cases disappeared in thirty-six hours.

Miss Hinckley also describes and figures (Proc. Bost. Soc. Nat. Hist., 1882, pp. 307–315) some differences in the mouth structure of the anurous batrachia of Massachusetts. These fall into three groups, which characterize the frogs, tree-frogs and toads. In the first the upper lip is shorter and narrower than in the others, and a papillose border, bending inwards at the angles of the mouth extends around the lower lip and overlaps the upper slightly on both sides.

In the tree-frog tadpoles observed (*Hyla versicolor* and *Hyla pickeringii*) the upper lip is broad and falls into two deep curves, along the lateral portions of which extend papillæ like those of the lower lip. The papillæ are small, and the papillose border does not bend inwards at the mouth angles. In the toads, *Bufo americanus* and *B. fowleri*, the upper lip is broad and nearly straight, and the lower lip is fringed and without papillæ in the the center.

The upper lips in all the species, the under lips when not edged with papillæ, and several fleshy folds which extend across both lips, especially the lower, are fringed with what appear in the microscope to be closely set teeth of uneven length. These fringes serve to collect and hold the food, both upper and under lips being used for this purpose; and Miss Hinckley observes that animal food appears to be preferred to vegetable by young tadpoles. *Rana sylvatica* has four fringed folds on the lower lip, while the other Ranidæ observed have three. *Hyla versicolor* has three fringed folds on the lower lip, while *Hyla pickeringii* has but two, and a short space of fringe on the margin of the lip. The same observer has also some notes on the development of *Rana sylvatica* which in many respects appears to be very distinct from other New England Ranidæ. It congregates earliest in spring for the business of oviposition, but cannot move in water below 45°F.

As many as 1380 eggs are contained in a single mass. The time in which the eggs develop varies greatly according to temperature. The metamorphosis of the tadpoles observed occupied from April 12 to June 9th, when the tail had wholly disappeared, and tadpoles which on May 31st measured 58^{mm} in length were reduced to young frogs 18^{mm} long. The external gills became fully developed two days after hatching, and in four days more were entirely resorbed, leaving an opening through which the action of the internal gills could be seen. The legs budded on May 6th, and by May 20 the feet and toes were well defined.

In the *Canadian Naturalist* (Vol. 9, p. 160), Mr. H. Montgomery observes that examples of Menobranchus kept in an aquarium plentifully stocked with mollusks fed entirely upon fishes.

Mr. W. Frear, in a note to the AMERICAN NATURALIST, gives a curious instance of the vitality of this batrachian. An individual that had lain exposed to the summer sun for forty-eight hours, and had been completely covered with alcohol for twenty hours gave undoubted signs of vitality, by opening its mouth and swaying its tail, when placed on the dissecting table.

Mr. J. S. Kingsley (Proc. Bost. Soc., 1881) notices a case of polymely, or the development of an additional limb, in an example of *Rana halecina.* The supernumary limb, is in origin and structure a limb of the left side, but occupies nearly the position of a tail. The myology of the proximal part of this extra leg is far less perfect than that of the distal, but the most singular abnormality is the formation of an acetabulum for the odd limb at the symphyis of the pubes.

Wm. E. Carlin (Proc. U. S. Nat. Mus. 1881) states that large numbers of the *Siredon lichenoides* of Como Lake change every season to the Amblystoma state, but that the change takes place much more slowly in the alkaline waters of the lake than in fresh water.

S. F. Clarke (Johns Hopkins University, Studies from the Biological Laboratory) gives the result of observations upon the development of *Amblystoma punctatum.* The eggs are deposited in masses of from two to three hundred, each covered with a tenacious gelatinous coating, at first thin, but rapidly becoming thick by absorption of water. Thus each egg consists of two membranous shells, separated by a space filled with clear fluid, and is well protected from voracious fishes. In the act of depositing

the ova, the female lies with her anterior limbs extended laterally, and her hind limbs curved round the opening of the cloaca, apparently to assist in holding the eggs together. If disturbed she leaves the spot, and commences the operation elsewhere. The male deposits the spermatic liquid upon the eggs. The spermatozoa are very large, .75 millimetre in length, while those of Menopoma are only .25^{mm} and those of *Rana temporaria* .008$^{mm.}$ They are long slender filaments, pointed at both ends. The ova, as usual in Batrachia, have a light and dark-colored pole, but the dark portion, instead of being much smaller than the light one, as is frequent, is equal to it in size, so that the third segmentation furrow is equatorial. After this furrow is formed segmentation proceeds most rapidly at the light colored pole, which is always the lowest, and the dark area increases until the only light part left is a small area around the lower pole, and extending upward from on one side. This white area then becomes surrounded by a furrow, and forms a prominence, the "vitelline plug" of Ecker. Gradually the vitelline plug sinks into the mass of the egg, except a very small round spot, from which extend outwardly the rudimentary walls of the medullary folds. By the end of the fourth day these folds have spread anteriorly to the cephalic end, and the egg has now become elongated in the direction of the medullary folds and their central groove. In about nine hours more the neural tube is enclosed, by this time the embryo has much increased in size and weight, and the entire surface is covered with cilia. A constriction next defines the head, and the optic lobes appear as oval prominences. The throat is next marked off, the proto-vertebræ appear, branchial lobes are developed, and the anterior limbs indicated. The tail lengthens, and the balancers, so-called from their resemblance to the balancers of dipterous insects, appear between the eyes and branchial lobes. Active muscular movements next occur, the gills are defined, the pulsations of the heart are visible, and pigment cells are produced. Most of the energy is now devoted to the growth of the gills and balancers, and at the next stage the caudal and dorsal fins grow actively. The balancers, held out so that they point outwards and downwards, aid in keeping the head and branchiæ free from the dirt at the bottom; they decrease as the anterior limbs increase, and finally break off, about twenty-eight days after the vitelline plug was formed. With the appearance of the third digit of the anterior limbs the lobes that will form the hind-

limbs commence to bud. At the age of sixty days all the external parts are formed, and it undergoes no external change except growth until the branchiæ are resorbed, a process which occupies from three to five days. The entire series of changes, in vigorous examples, occupies about a hundred days.

The same writer gives an account of the development of the Wolffian body in this salamander. It arises from the outer layer of the mesoderm as a solid rod of cells, and is at first largest anteriorly, a dorsal and ventral duct are then formed by the splitting of the cells, and an opening into the body cavity is made from the dorsal duct. The method of development of this organ differs from that observed in allied forms that have been worked out, and is most like that of the Elasmobranchiates.

The same laboratory furnishes some interesting notes upon the secretion of the pepsin-forming glands of the frog, by H. F. Sewall. The œsophageal glands, which, when the intestinal canal is empty, are full of fine granules, undergo marked changes in digestion, losing the greater part of these granules during the process. These changes are started by the mere absorption of matter from the alimentary canal, but the regeneration of the glands depends upon the presence of new matter in the blood itself.

The fifth Bulletin of the Illinois State Laboratory of Natural History is a list of the Batrachia and Reptilia found east of the Mississippi, by N. S. Davis and F. L. Rice. *Siren lacertina* is credited to Northeastern Illinois. The Bulletin No. of the U. S. National Museum consists of a check-list of the Reptilia and Batrachia of North America. The classification is based on that of Professor Cope, as set forth in Bulletin No. 1, of the same series.

The work of Dr. J. J. Mason, upon the minute structure of the central nervous system of certain reptiles and batrachians is a valuable addition to our knowledge of brain-structure in the latter, illustrated as it is by artotype plates taken from negatives made by the author. Numerous sections of the spinal cord and brain of Rana, Menopoma, Diemyctylus and Siren are given. The transversely-developed spinal cord of Menopoma, deeply fissured posteriorly, contrasts greatly with the oval and slightly fissured form of that of Rana. The writer does not claim to distinguish between motor and sensory cells, and considers that the theory which makes the nuclei the true function centres of the nerve-cells, is an unproved one.

WOOD NOTES AND NEST HUNTING.

BY HORACE LUNT.

PASSING along an old dam, now unappropriated and neglected, where, on either side of it, trees have since its building grown to maturity, now watching for awhile the adventurous bream which approaches the shallow water for Gerris and water-beetles, and whose motions appear to be dull and heavy by the surfeit of this continual feast, my eye is arrested by another insect-catcher of the air, the wood pewee. With what unerring precision it darts upon some aspiring beetle, and returns to its observatory on the opposite shore!

This bird is not shy when engaged in its legitimate pursuits, and will allow a very near approach. His head is continually moving from side to side; he occasionally stops, however, to preen his breast feathers; which seem to be always ruffled, or with uplifted claw to give his crown a series of quick, spiteful digs, and with droll performance peer under his outstretched wings for a troublesome parasite. Now he darts off, flying fifty yards away in a straight line, to gobble an insect which he sees at that distance, not returning to his post, but to a sycamore growing on the dam. This is the season of incubation, and I suspect, considering the good provider and kind husband that he is, that this tid-bit just captured is for his consort.

No one, without the aid of the bird, could expect to find such a nest. How nicely it is saddled on the end of a horizontal bough, thirty feet from the ground, so shallow that one can see, even at this angle of vision, the head and back of the female as she sits upon it. The couple did not wander far for their building material, for the nest is chiefly composed of mosses and thin plates of old bark that cleave from the young growing liber, so characteristic of the buttonwood, glued together with saliva, which nature has so bountifully supplied to many of the birds. There she sits, evidently not caring whether her nest or her presence has been discovered. Her head moves about freely, and once she cannot resist the temptation of flying off to seize a passing insect, but returns immediately to her task. Here comes the male once more, and standing close beside her, gives a kiss and a beetle in the bargain. How gallantly he breaks it to her, while she, as is her prerogative, receives it with cool indifference,

and bids him go for more. As he stands on the branch an instant, his back toward me, and the broad leaves uplifted by the wind let in a sunbeam upon him, I note a shade of dark green, and the long pointed wings, reaching down half way on his tail, which is not so deeply forked as is that of the olive-sided flycatcher, a first cousin, whom he otherwise much resembles. When he rises I see in this individual an exception to the general dress of the under parts of this species. The pale yellowish tint of the breast is replaced by whitish ash. The song is not often heard, as if he was aware of the melancholy strain, and had the good sense to consider the feelings of his mate during the distressed period, and worked for her crop's sake instead. Resting on this slope in the shade of the beech trees, watching the gambols of a pair of large purple-black butterflies (*Vanessa antiopa*) flying high up among the trunks, attracted there, no doubt, by the nectar that exudes from the bark, I hear the energetic notes of the oven-bird or golden-crowned thrush (*Siurus auricapillus*). Immediately after a little bunch of feathers drops down from a low branch, and goes pecking here and there on the ground, not a rod from where I am sitting. He takes long, quick strides, as he turns his head to look at me, now half tumbling over dead sticks that lay in his path, or getting his long hind claw tangled in the blackberry vines, and making little exertions to clear himself. Now he runs swiftly ahead to capture a beetle or turns back quickly sideways for some crawling dainty which nearly escaped his notice. How much the color is like that of the leaves and grasses and vines through which he forages. The upper parts are of dark olive-green, with two dark streaks on the crown, and a broader brownish-yellow one between them, with the breast and sides of dirty white, streaked with black.

I believe not many of the birds sing while upon the ground. They love to mount some kind of stage, on which to pour out their melodies. But the golden-crowned hardly thinks it worth his time to take the pains to fly to a music stand whenever the inspiration siezes him, but stops his feeding for a brief interval, lifts up his head an instant before commencing, as is the habit of some of our best singers, and utters in a loud clear tone the syllables *cheat-er cheat-er cheat-er*. The song is not like any other in the woods. Listening to his lay at noon-time, when the sun's rays are pouring down on the mosses, one imagines it is not so

sprightly as in the morning. There appears to be a dragging of the notes, as though the little songster was worn out with the heat, and although he may be very near you in shade, the first syllables seem to come from a distance, showing his great powers of ventriloquism, gradually sounding nearer and louder, until he reaches the climax. This is his commonplace humming after all, for Mr. Boardman, a close observer of the birds, says he has another song at times, so rare and beautiful that but few know it as from that bird.

His nest is not far from here, for when I happen in this vicinity his song is sure to be heard. He likes just such a place as this, shaded slopes near a stream. As you walk along you see hundreds of depressions, little hollows under the roots, crevices in the ledges, and hide-away places generally in which you would choose to locate a nest, but thus far it has escaped my search. How shrewd these birds are in concealing their homes, not only from the sight of man, but often, as they must, from the sharper cow bunting, whose special instinct it is to intrude upon them, and from the numerous greedy prowlers that go nosing round, both night and day, for just such morsels as the nests of these ground builders offer.

The general intelligence of birds, considering their comparatively low position in the scale of creation, seems to me remarkable. How alert they have learned to be on account of these surrounding dangers. How many little schemes they invent to deceive you. This same golden-crowned is a curious bird. He likes to be near you, though he does not want you to be aware of it; so he flies swiftly past, far enough, he probably thinks, for you to lose sight of him, when he makes a detour, and finally comes back again along another air line, and flits behind a rock a few yards away, with the probable satisfaction that he has completely outwitted his vexatious follower, and can watch you at his leisure without being observed himself.

It is amusing also to observe the cuteness of these crows, whose young are nested in a tall pine near by. Only a stifled suppressed scolding croak escapes them now, as though it was hard for them to keep in so long. If they could give a few loud disagreeable caws it would be such a relief; but it behooves them to be silent, that their enemies' attention may not be directed to this one place on earth, wherein is centered all of their affection.

Two small birds, with ashen heads and olivaceous backs, and breasts of reddish-yellow, flutter down as noiselessly as butterflies, close to my rather uncomfortable position, in a patch of green-briers and blackberry vines. They have taken me by surprise, and almost before that feeling has been replaced by inquiry they have moved off again in their nervous way, flying in all kinds of places, now down to the ground, or zigzagging among the shrubs or smacking with their bills among the leaves, as they glean in the highest branches of the elms and willows. At length one, with undulating flight, wings its way to a small cedar, and hides in the thick foliage. The movement is so different from the usual manner of proceeding from bush to tree, that one suspects a subject of great importance possesses the bird, and watches sharply for developments. Sure enough, there in the horizontal fork of a limb, not fifteen feet high, the American redstart (*Setophaga ruticilla*), the red-tailed insect eater, has laid the foundation for a nest. From a human standpoint, the locality is not well chosen; situated as it is, quite near a wood-path, and in full view of every young rambler who may feel disposed to rob. Though placed in this opening, how nicely the general colors of the material of which it is composed harmonize with that of the bark of the limb. No one without the aid of the bird would discover it, it is such a wee bit of a construction, and so accurately fitted among the smaller twigs. How busy the little worker is. Though taking observations quite near, she does not appear in any way disconcerted, but works on as if her very existence depended upon completion of the nest in a given period of time. Here she tugs for a bit of lichen, which will match well with her home surroundings. There she flies down in the swamp for a particular bit of sodden last year's plant-stem, to suit a certain defective place in the side; she knows where it belongs. The dead branch of a willow, almost denuded of bark, which the rain and sun, year after year, whips into fine cottony nesting stuff, offers material, and to this she often goes for rifting pieces. Half flying and hopping along its length, she searches for a loose end, and when it is found, stops, and having secured a fast hold with her beak, gives a sturdy upward pull, which evidently requires all her strength to remove the bleached strip, and flies with it to her home.

She always builds from the inside, never placing material on the nest while standing outside of it. The cavity must be looked

after and nicely turned and pressed to fit her precious little body, so she gets in and squats and turns round and round with outspread tail and wings, tucking in here and there, and fastening with saliva the stray ends, and hugging with her chin and bill the outside edges against her breast. The delicate structure is progressing rapidly, and the female appears to be the chief architect and worker. If the male comes it is only to flaunt himself before her and disappear. These are evidently young birds, for on the occasional visits of the male I notice the color is similar to his wife. His tail coverts and tail, however, are darker with perhaps a deeper orange-red on the sides of the breast. He will have to wait a year or two before he puts on the uniform of black and red that older male birds wear.

In a week the nest is finished; the upper parts are slightly drawn in and compactly thatched. Now that the task is off her mind, she appears more cautious, and uses many little devices; fluttering among the lower branches or flying into the farthest side of the tree and skulking up to the nest, with the hope that her skillful manœuvering has been successful in eluding my vigils. As I approach the nest she utters a sharp *chip, chip*, precisely like the note of the hair bird, but does not manifest any extraordinary signs of distress. She remains at her post of trust till the last second, and then eyes me keenly from one of the branches above, as if she had the conscious power to prevent me from stealing away her home. It is a deep cavity, upholstered with fine grasses and a few horse-hairs, on which rest already two tiny eggs, the ends of which are very unequal, tapering quite acutely from the larger part. The ground color is white, blotched with reddish-brown, as if the bird had rubbed on them some of the coloring of her breast. I dare not breathe on the sacred things lest the parent consider them polluted, and forsake the dearest spot to her on earth. No fear of her! Sensible to the last, she seems to have comprehended the object of my visit, for hardly have I withdrawn a reasonable distance when she again flies to her nest, and with a cant of her head, as she stands on the edge, says: "There, you big fellow; I trust you are satisfied with your investigations. Now leave me to finish my work in peace."

In this thick clump of high blueberry bushes, interlaced and overgrown with greenbriers, madam catbird has improvidently

made her home. While looking through the interstices of leaves and sprays from the other side, to observe the devoted actions of the pair, I discover another oölogist, but with more hostile intentions than the writer. A small striped coachwhip snake has laid the several portions of its lithe body conveniently along the twigs and there remains as motionless as any part of the bush. After watching it for a time, I make various noises to ascertain to what extent it can be affected by sound, and seeing that it does not stir from its resting place, I slightly shake the bush, when it lowers its head, darts out its forked tongue, but seems unwilling to move. Nature has given to its skin the general hue of the bark, and probably it instinctively remains in this position, relying more for protection on the harmony of color and being at rest than upon escape by any other means. Just as I am about to take more vigorous measures for its removal, the bush is struck by a sudden breeze, which appears like a palpable intervention; while the serpent takes advantage of it, and glides through the tangled mass out of reach.

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EDITORS' TABLE.

EDITORS: A. S. PACKARD, JR., AND E. D. COPE.

—— The Society of Naturalists of the Eastern United States held its first full meeting in Columbia College, New York, during the Christmas holidays. The aims of this body, so far as they are developed, appear to be to sustain the business aspect of the pursuit of natural science in a material and practical way. The papers read related to the means rather than the ends of the scientific career, no discussion of subjects of pure science being in order. The questions discussed may be classified as follows: (1) The methods of original research. (2) The methods of teaching. (3) The constitution of societies and academies of science. (4) The employment of competent specialists by the educational institutions of the country. In each of these departments much is to be accomplished in this country, and none who attended the meeting failed to gain ideas on these topics. The society has chosen to restrict its geographical range in order to relieve its members of the necessity of traveling long distances, which considerations of time and money render impracticable. It is anticipated that other sections of the country will adopt similar organi-

zations, should they feel the need of them. A committee to define the terms of membership was appointed. The time of holding the annual meeting was fixed for the Christmas holidays as most convenient for teachers.

The goodly attendance and interest shown in the meeting, proved that the City of New York was the most convenient place, and that the holidays are the best time for such a meeting. Members from the leading colleges and museums of New England and the Middle Atlantic States were present, and the sentiment that such a society had an unworked field before it was generally entertained. The topics were in nearly every case of a practical nature, such as the methods of lecturing, of teaching, of laboratory work, of the arrangement of museums, both from a scientific and educational point of view. Biology is to be more and more dependent on exact and careful methods of preparing material for study, and hence a large amount of attention was devoted to histological methods and processes, such as the cutting and staining of microscopic sections, methods used in the microscopic study of rocks and to allied topics. The relations of the original investigator to the public, and the necessity of maintaining academies and institutions for original research was discussed. The society has begun well its work, and will doubtless, by the numbers of applicants for membership which were presented, become a live, zealous and wide-awake body of working men. Its membership should, however, be carefully selected, so that it may not be too unwieldy, and be burdened with too much dead wood.

—— It is to be earnestly hoped that the three great national scientific bureaus will obtain due recognition from Congress this winter. We refer of course to the National Museum, the Geological Survey and the Fish Commission. The results of these organizations are doing infinite good in aiding to counteract our utilitarian and non-intellectual tendencies, and the country cannot underestimate the value of the labors, especially of Professor Baird and afterwards of Hayden, Wheeler, King and Powell, in originating and conducting these admirable enterprises.

The disposition of the surplus which the Government is annually accumulating, has become an important question. Congress cannot do better than appropriate it for the advancement of science by fostering those great works which by their nature are too expensive to be undertaken by private persons. The money may be much worse spent.

RECENT LITERATURE.

MISSION SCIENTIFIQUE AU MEXIQUE; RECHERCHES ZOOLOGIQUES; TROIS. PARTIE, RECH. SUR LES REPTILES ET LES BATRACIENS, par MM. Duméril et Bocourt.—This part of this magnificent work advances well into the Ophidia, which is the only order remaining to be completed to bring the series to a close. Forty-eight species are described, of which thirty-six are figured as to the details of the scutellation of the head and adjacent parts of the body. These figures are nicely executed, and two of them, representing species of Ninia, are full length and colored. This work brings the subject of Mexican Ophiology nearer to date than any general work, and includes a number of species of North America and the West Indies. We have not been able in previous numbers to praise the systematic treatment of the subject, and the present number presents rather more numerous defects than any of its predecessors. Thus the species described purport to belong to the group Calamariinæ. Nevertheless it is quite certain the serpents like Ninia cannot belong to the same natural group as Catostoma and Carphophiops, the only character they possess in common being their *small size*. I have shown in fact[1] that Ninia must be arranged with Storeria and Tropidonotus on account of the presence of hypapophyses throughout the dorsal vertebral column. As to nomenclature, the failure to adopt the names of Baird and Girard, where they have priority of date of publication over those of Duméril and Bibron, is a serious error. Inconsistencies in nomenclature are observable. Thus Chersodromus is adopted, while Colorhogia, which rests on the same differential character, is not adopted. The genus Enulius is wrongly identified. We now give a corrected nomenclature of the species mentioned in this work:

Geophis hofmanni should be *Colobognathus hofmanni* Peters; Geophis semidoliatus, chalybæus, dubius and rostralis, should be *Catostoma* respectively; and Geophis rhodogaster Cope, should be *Colophrys rhodogaster* Cope; Carphophis amœna = *Carphophiops amœna* Say; Enulius murinus should be *Geagras longicaudatus* Cope; and E. sumichrasti, *Geagras sumichrasti* Boc. Conocephalus D. & B., is *Haldea* B. & G.; Streptophorus D. & B., is *Ninia* B. & G.; and St. sebæ D. & B., 1854, is *N. atrata* Hallow., 1845. Lamprosoma Hallow., was long since changed to *Chionactis* Cope, because preoccupied; and L. episcopum is *Contia episcopa;* Cryptodacus redimitus is *Colorhogia redimita* Cope. Conopsis includes three genera, as I have pointed out. *C. nasus* and *C. maculatus* properly belong to it, while C. lineatus is *Toluca lineata* Kenn., on account of the presence of internasals. C varians belongs to the genus *Ogmius* Cope, on account of the presence of grooved teeth.[2] In the same way Ficimia ornata is distinct from Ficimia

[1] Proceedings Phila. Academy, 1864, p. 167.
[2] See Journal Academy Phila., 1875, p. 142.

in the presence of internasal scuta, and should be referred to the genus *Gyalopium* Cope, of which it is the second species. It was described some years ago[1] as *Ficimia publia* Cope. The Pseudoficimia pulchra is the *Geagras frontalis* Cope,[2] the difference from the other species of Geagras figured on the same plate, *i. e.*, the separation of the nasal from the preocular by an interspace not being of generic value. Scolecophis Fitz., should be *Scolecophis* Cope, who first described the genus. Homalocranium D. & B., is *Tantilla* B. & G., of prior date. Here should come the genus Enulius Cope, which is truly glyphodont, though the authors of this work assert the contrary. Ogmius should also be placed near to Stenorhina in the glyphodont series.—*E. D. C.*

CHAMBERLAIN'S GEOLOGY OF WISCONSIN[3].—This is not only one of our best State reports, but one of the most valuable and interesting. Beginning to look casually over the first part of Vol. I, entitled General Geology, by the chief geologist, we expected to find the usual résumé for popular use, but while it is entertaining, for it held our attention from its able summary of the whole story, it will continue to have permanent value from its discussion of the Archæan age as well as the Glacial epoch. We should unhesitatingly recommend any beginner or advanced student in geology to read this part of Vol. I in connection with his geological manuals.

The candid, well-balanced mind of the chief geologist is seen throughout the entire narrative as well as in the discussions and references to the opinions and works of others. It is evident that the survey has been in good directive hands, while the reports of the assistants prove that the details have been carefully and skillfully elaborated. The people of Wisconsin are to be congratulated on the results of such excellent work, and on having them presented in a simple, intelligible form.

Beginning with the hypothetical and pre-Laurentian history of Wisconsin and of North America in general, which is discussed in a fresh and comprehensive way, we find a good sketch of the Archæan age, which seems to us, in some points, more satisfactory than that given in the text-books. To be sure nearly every point of interest connected with this age is under debate. Professor Chamberlain, however, adopts Selwyn's view that the upper portion of the Laurentian, *i. e.*, those strata bearing the great beds of limestone and iron, as well as graphite, belong in reality to a later or Huronian age. "All the facts thus far disclosed in Wisconsin support this view, which, pending the results of investigations which must yet occupy some years, we shall assume to be

[1] Proceeds. Phila. Acad., 1866, p. 126.

[2] Loc. cit., p. 142; *Toluca frontalis*, Proceeds. Phila. Acad., 1864, p. 167.

[3] *Geology of Wisconsin. Survey of 1873–79.* Vols. I–IV. Atlas of maps. Vols. I, IV, 1882 '3. 8vo.

the correct one. The Archæan limestone and iron-ore beds of New York are likewise considered to be Huronian."

Succeeding the Huronian, a great formation, 40,000 or 45,000 feet in thickness, of which probably three-fourths is igneous material, and known locally as the Keewenawan period, is described. This is supposed to represent the Acadian rocks of the Atlantic border of New England and the provinces, and probably the Lower Cambrian formations of Great Britain and Bohemia.

The author discards the term period, and we think more logically regards the Laurentian and Huronian as ages, remarking: "In standard works on geology it is customary to dismiss all that precedes this era with a few pages devoted to the Laurentian and Huronian *periods*. In some, indeed, the latter age is not even separately recognized. When best considered these divisions are ranked as periods, and thus placed in the category of formations that often measure fewer hundreds of feet than these do thousands. Even in the more extended views presented in this sketch, relative injustice is done the earlier eras. In discussing the Laurentian, measuring as it does accumulations many thousands of feet in thickness, we only consider it as a whole, making no attempt at even an enumeration of the subordinate periods of deposition that marks its history. Even in describing the Huronian system we barely enumerate the successive thick deposits, though they embrace rich and varied accumulations of ore, carbon and lime, besides common detritus. Were these unmodified members of the later systems, they would doubtless be ranked as important periods, and the whole Huronian system would be graded as the equivalent of the Devonian age, or perhaps of the Mesozoic era."

For these and other reasons we like, on the whole, the author's tabular view of the geological eras, ages, periods and epochs.

The portion relating to the Quaternary age, particularly, gives a most useful and clear summary of glacial geology, especially in the Wisconsin and adjoining areas. Two glacial epochs are described, their existence clearly proven, and the colored restorations or theoretical maps of the two periods will be found to be most useful and timely. We have nowhere met with a clearer and more comprehensive exposition of the subject, and the proof that the great lakes were mainly excavated by ice seems, contrary to our own impression, quite reasonable. Space will not permit us to notice the work of the able collaborators of this survey, especially that of Mr. R. D. Irving, the late Moses Strong, Mr. R. P. Whitfield, Professors L. C. Wooster and F. H. King, and others. As they stand, the four volumes of this survey are a notable addition to our geological literature.

U. S. FISH COMMISSIONERS' REPORT FOR 1880.[1]—The annual reports of the U. S. Fish Commission reach us each year, of just

[1] *U. S. Commission of Fish and Fisheries.* Part VIII. Report of the Commission [S. F. Baird] for 1880. Washington, 1883. 8vo, pp. 1060.

so many pages, seldom, if ever, under a thousand, replete with matter of interest to naturalists and to fishermen, as well as to the general public, together with some padding to fill out the portly tome. The most notable zoölogical contribution is Mr. Goode's "Material for a history of the sword fish," a comprehensive account including a notice of the fisheries. It comprises ninety-nine pages and twenty-four plates, and is published rather to stimulate inquiry than as a complete monographic account of these fishes, so difficult to carefully study in nature. A large proportion of the report is filled with translations of foreign papers on different piscicultural topics.

ADOLPH'S MORPHOLOGY OF THE WINGS OF HYMENOPTERA.—This important memoir was published during the past year in the *Nova Acta* of the Imperial Leopold-Carolinian German Academy of Naturalists, under the title: "On the morphology of the wings of Hymenoptera. Forming a contribution to the question of the origin of species and of atavism." It is illustrated by six plates, five of which are filled with photograms of portions of wings, illustrating the variations and abnormalities in the venation. It is in continuation of an earlier similar work, published in 1882, on insect wings.

It is impossible to make an abstract of these interesting researches on the variation of venation, as the author does not present us with one. He closes the work, however, as follows: "The number of drones of *Apis mellifica* here studied amounts to 1918; of these 889 specimens with 2107 anomalies of thirty-eight different types or formations (bildungen) were surveyed in the most exact manner in tables, the remaining ones only with reference to the rarest forms. Three hundred and twenty-six worker bees and 125 queens were brought together for comparison. Among isolated deviations have occurred only those figured on Taf. 5, fig 2; Taf. 4, fig 5, and these indeed have a noteworthy relation to the allied kinds of venation. All the other anomalies are united in a strong normal relation. * * * Until the present time the venation has been used only for systematic uses. But now they have an interest from other points of view, and especially valuable are these abnormal formations which are opposed to artificial specifications and break over the limits to species which our comprehension of Nature has raised. It would be difficult to find a species which affords so rich a mine as the drones of *Apis mellifica*. But much is accomplished if we no more hastily throw aside, but consider it worth while to give thoughtful consideration to and compare them with other—be they normal or deformed—venations. In the Hymenoptera especially is the use of the venation in the discrimination of species nearly exhausted. There is a possibility still open, through these researches, of opening a new line of inquiry, whose perspective reaches far beyond the consideration of purely entomological questions."

THE STANDARD NATURAL HISTORY.[1]—We have received six parts of what promises to be a most timely and excellent work. The publishers and editors have gone to work in the right way in securing the aid of specialists in writing upon special groups. In this respect the work will be an advance even upon Brehm's Ani-

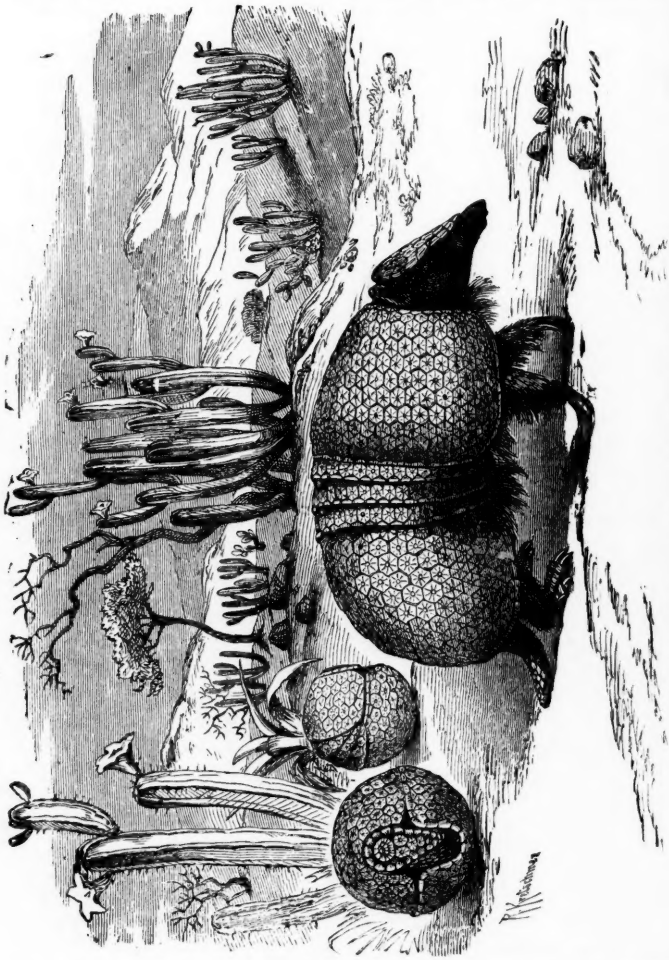

FIG. 1.—*Polypeutes tricinctus*, three-banded Armadillo.

mal Life, which was prepared by only a few writers, while the

[1] *The Standard Natural History*. By the leading American authorities. Edited by ELLIOTT COUES, M.D., and J. S. KINGSLEY. Boston, S. E. Cassino & Co. 50 cents a part, $6.00 a volume, cloth.

editors of the present work have engaged nearly forty collaborators. The difficulty will be to secure sufficient unity in the mode of treatment by so many authors; but we do not see any marked signs of this in the parts before us. This is a subscription work, and most publishers of such works for popular sale are timid and even silly about admitting anything that looks like evolution, but

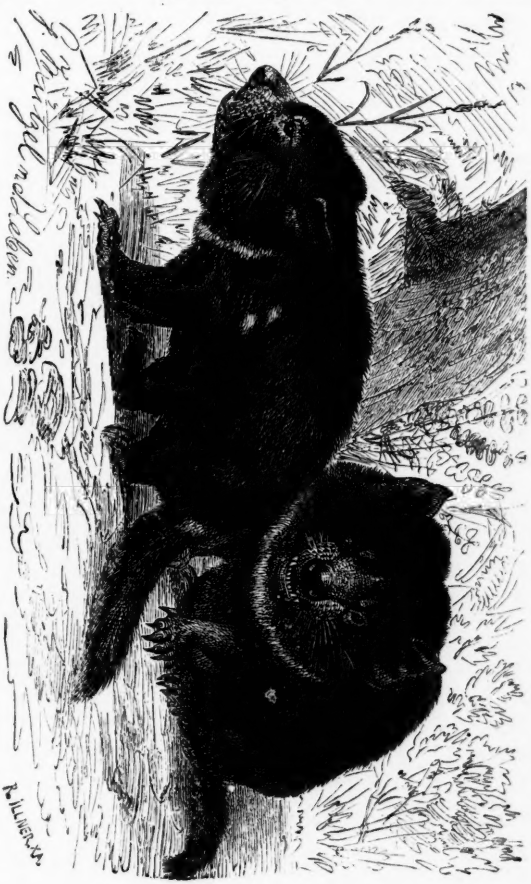

FIG. 2.—*Dasyurus ursinus*, Tasmanian devil.

the present work is as it should be, in accord and in fact based on this principle. We notice in the parts before us that the Protozoa are treated by Mr. Romyn Hitchcock, the Infusoria by Dr. D. S. Kellicott, the Crustacea by Mr. J. S. Kingsley and Professor E. A. Birge, the mammals by Dr. Coues, Professor R. R. Wright and Professor T. Gill. The names of the other contribu-

tors are a guarantee of the permanent value of what will be a representative American work. It should be widely patronized. The illustrations are ample, many indeed from European sources, but with many original sketches. The paper and presswork are faultless. The work is to be issued in six imperial octavo volumes; Vol. I is to be devoted to the lower invertebrates; Vol. II to arthropods; III to the lower vertebrates; IV to birds; V to mammals, and VI to the races of man.

DAVIS AND RICE'S NORTH AMERICAN BATRACHIA AND REPTILIA FOUND EAST OF THE MISSISSIPPI RIVER.[1]—This little book presents us with the best synopsis of our cold-blooded land Vertebrata of our region which has yet appeared. The characters of the divisions are better drawn than in most American general works, though this is not very high praise. In fact there is room for much improvement in this respect, and it could hardly be otherwise, so long as no general work based on a general revision of the subject is yet published. The greatest defect is seen in the artificial keys, which are only evil, and that continually. It is well enough to have them, but they can be so constructed so as not to make specific and individual characters appear to be of generic or even of higher value. Similar objection may be made to the artificial keys in Jordan's Manual, and Coues' Key to North American Birds.

The authors extend our knowledge of the geographical distribution in a good many important points.

ON THE FORMATION OF THE EGG AND THE BLASTODERM IN THE VIVIPAROUS APHIS, by Ludwig Will.[2]—*I. The Formation of the Egg.*—Will studied by means of sections and fresh preparations the ovarian tubes of the viviparous form of Aphis. He found that the terminal chamber differed, in histological details, considerably from that hitherto described by authors. Huxley, Leuckart and Claus considered that the terminal chamber of the oviparous Aphis differed considerably from the viviparous form, not only in the whole arrangement and signification of the elements, but also in the existence of a yolk passage. Will, however, shows that in the viviparous Aphis there exists also a yolk passage, and that the arrangement of the cells in the interior of the chamber is quite the same as that in the true females, and the elements he considers as vitelligenous cells. The wall of the fully developed ovarian tube of the adult is formed of a single layer of epithelial cells, which not only covers the egg chamber but also the terminal one. Nothing was seen of the structureless tunica propria mentioned by former writers on the subject, although he used in his investigations one of Zeiss's homogeneous immersion lenses.

[1] *Bulletin No. 5 of the Illinois State Laboratory of Natural History.* Feb., 1883, pp. 66.

[2] *Zur Bildung des Eies und des Blastoderm bei den Viviparen Aphiden.* Von LUDWIG WILL. Aus den Arbeiten d. zool. zoot. Instituts in Wurzburg, Bd. VI.

The terminal chamber, in which the egg is formed, consists of two parts. The wall of the upper part is formed of pavement epithelium, which is continued into the solid interior part. In the interior of the upper part he finds a rounded mass of protoplasm, and between this and the external layer of pavement epithelial cells is a single layer of large cells (the ovula). These cells are each connected with the internal mass by a pedicel of homogeneous protoplasm. The pavement epithelial cells pass into long cylindrical cells at the inferior part of the terminal chamber; this part of the terminal chamber contains, as a rule, only one large cell, the young egg, which is also connected with the central mass of protoplasm by a pedicel.

In the oviparous Aphis, in which a similar structure of the terminal chamber is well known, the cells of the upper part of this chamber have been generally taken for vitelligenous cells, one cell in the lower part for the egg and the pedicel for a passage for vitellus prepared by the vitelligenous cells.

Will shows, however, that at least in the agamic Aphis the elements have quite a different signification. He considers the cells in the upper to be ovula (eianlagen), and the large cell in the lower part a young egg.

The pedicel has nothing to do with a yolk passage, but only corresponds to the pedicels of the ovula.

When one of the ovula has reached a certain size it leaves the upper part of the chamber, but the pedicel remains and forms later that which the authors have called the yolk pedicel (dotterstrang); this remains until the blastoderm is developed. So we often find as many as three successive eggs in connection with the terminal chamber.

On the way downward the egg continually grows, and the cells of the epithelial covering becoming more and more depressed; the ovula do not increase in size at all.

Here two very interesting questions arise: (1) Why does one of the ovula of the terminal chamber leave its place and become a young egg? (2) Why do the eggs and not the ovula increase in size?

(1) At the time when no ovulum has yet left the terminal chamber, and when all the elements of this part of the ovary are of the same size, all the cells necessarily assimilate and grow in the same way. There is no reason at all why they should not, for the ovula are all of the same size and age, and besides this they are all equally near the walls of the chamber and receive an equal supply of nourishment from the blood which bathes the exterior wall of the chamber. The cells grow equally, and exert a great pressure in the wall of the chamber, and the result must be a bursting of the wall of the chamber or a protrusion of one of the ovula into the chamber below. At the base of the chamber, where it passes into the oviduct, the resistance is much less

than that at any other point, consequently the ovulum at this point passes out, drawing with it the pedicel of protoplasm which still remains in connection with the central mass, which Will calls the "*rachis*," and which corresponds to the rachis in the *nematodes*. The ovules have now a chance to grow again, and when the pressure is again exerted another passes out.

(2) In a similar way the growth of the young egg is explained. The ovula as well as the young eggs being connected with the rachis by a string of protoplasm they cannot be considered as distinct cells, for it must be considered that the protoplasm is common to all the cells. It is evident that the new protoplasm which the egg and ovula acquire by a process of assimilation is common as well. The pressure exerted upon the epithelial layer of the egg is not as great as that upon the wall of the terminal chamber and consequently there is much less pressure on the egg than on the ovula. Owing to the great pressure on the ovula, the growth is not so rapid as in the egg, consequently much of the common protoplasm of the terminal chamber goes for the nourishment of the egg through its pedicel.

The cells of the terminal chamber not being vitelligenous cells but ovula, the pedicel is consequently not for the passage of yolk but protoplasm.

II. Formation of the Blastoderm.—The young egg, which possesses no membrane at all, consists of a very homogeneous protoplasm. The clear germinal vesicle (keimbläschen) does not take any color in carmine, while the dense germinal spot (keimfleck) takes a deep stain.

By examining large numbers of eggs in the first stages of development Will finds that the germinal vesicle does not disappear. The first change consists in the appearance of a great number of little vesicles of deutoplasm which are quite different from the later fully developed deutoplasm called by Metschnikoff "secondärer dotter." These vesicles fill up the whole protoplasm with the exception only of that near the periphery of the egg and that which immediately surrounds the germinal vesicle which is really not surrounded by deutoplasm but lies in an irregular layer of protoplasm. In section he found the primitive nuclei in different stages of division, so that the nuclei of the future cells are derived directly from the germinal vesicle. After division of the germinal vesicle, each part becomes surrounded by a layer of protoplasm, and passes to the peripheral protoplasmic layer, where they undergo division and form the future cells of the blastoderm. The blastoderm consists of a single layer of cells which possess a common protoplasm and only later do they become separate. The blastoderm does not cover the whole surface of the egg, for at one pole (the basal), the deutoplasm extends to the surface of the egg.

Will differs considerably from A. Brandt as regards cell divis-

ion, and considers him wrong in a number of other points. He describes a division which is only known in Actinosphærum, where it was described some time ago by Grube.

The principal thing is that it begins with a change in the nucleolus, which breaks up into a great many little particles. These particles are arranged in a definite way so as to form different figures, of which the rod-like form (stäbchenform) is the most common and characteristic. The substance of the nucleus is not modified at all, and only its exterior form is changed. From a spherical vessel it changes to an elliptical, and then into a biscuit-shaped body, after which stage the division takes place.

Will also criticises the "keimbläschentheorie" of A. Brandt, where Brandt considers the germinal vesicle a cell. The theory is based on the idea that the germinal vesicle equals the epithelial as well as the blastodermic cells. Will finds that this basis is false and consequently the theory built upon it is also false.—*B. Sharp.*

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GENERAL NOTES.

GEOGRAPHY AND TRAVELS.[1]

ASIA AND THE ASIATIC ISLANDS.—Mr. C. Trotter's paper upon New Guinea, read before the British Association, contains much general information. Geologically this large island is nearly related to Australia, its separation from which is probably not earlier than the Lower Miocene. West of the Gulf of Papua the ground is low and swampy, with isolated hills which probably were once islands. Westwards as far as Princess Marianne island the sea is so shallow and the coast so low that nothing is visible from shipboard. Here a great submarine bank extends to the Aru islands. The west and north coasts are mainly precipitous—the cliffs frequently of recent limestone, with raised coral beaches—broken by considerable rivers, with flat mangrove-covered banks, affording access to the interior. Except at these spots the densely wooded mountains make access very difficult. The north coasts are almost free from reefs, but the south coast is skirted by one

[1] This department is edited by W. N. LOCKINGTON, Philadelphia.

at a distance of five or six miles, thus forming safe anchorages. The interior here consists of ranges of rolling grassy hills with scattered eucalyptus, acacia, etc., interspersed with streams, and contains tracts well fitted for sugar and other tropical crops. Beyond is the Owen Stanley range 13,000 feet high. The rocks of this range appear to be the same as the Devonian and Silurian series of the New South Wales gold-fields. The central mountains of the northwest peninsula, the Arfak, seem mainly granite and gneiss. Though severe earthquakes occur on the north coast, no active volcanoes have yet been found.

The level of civilization among the isolated tribes of Papuans varies greatly. Some are skillful and industrious cultivators, but their plants and their agriculture appear to have come from Asia. Cannibalism is not common, and is, perhaps, mainly confined to war time. The spirit of the dead ancestor is supposed to enter into his image or Karwar, so that a man would rather part with the skull than with the image of his father. This ancestor worship is the principal part of their religion. They show a marked feeling for art in the ornamentation of their houses, weapons, tools, etc. They are a rude, boisterous, independent people, with a keen sense of their rights, not only in the soil, but in the fruits of the forest trees, and in the fish of the streams belonging to the tribe. Though the Malay custom of building the houses on piles is general, some are also built on the ground, or high up in trees.

The eastern peninsula is partly occupied by a fairer and milder race, with Polynesian affinities, but with a religion even more rudimentary than the Papuan. The people of the north coast generally are finer than those of the south, perhaps through intercourse and intermingling with the emigration passing from Asia to the Pacific, while the people of the south coast have had relations mainly with the inferior Australians. Hereditary rank is not a Papuan conception, and the power of the chiefs is small.

The Malay rulers of the small islands Bachian, Gébé and Tidore have, since the fifteenth century, laid claim to New Guinea. The Dutch base their claims on those of the last, as their suzerainty, and have annexed the western part as far as 140° 47′ E. long. New Guinea was actually discovered by the Portuguese or Spaniards in 1526–8, and by the time of Torres most of the outline was roughly known.

The Southern Chinese.—It would seem, from the facts brought together in a paper read before the British Association by Mr. H. S. Hallett, that the claim of the Chinese Emperor to the suzerainty of Tonquin and Annam may be regarded as the revival of a once real, though now obsolete right.

The Chinese Emperor Yaou, who came to the throne B. C. 2356, sent the tribe of Hi to take possession of the country to the south of the Yangtsi. Kingdoms thus formed extended south of Tonquin, B. C. 2208. The Annamite and Shan kingdoms were

in existence within the bounds of the Chinese empire before its earliest contraction. By B. C. 1550, owing to revolts, it had contracted to the northern bank of the Yangtsi-Kiang, and during the Chou dynasty, B. C. 1134–255, it seldom included any portion of the basin of that river. The elder brother of the founder of the Chou dynasty left the empire, and founded the kingdoms of Youe and Hou outside of it, on the frontiers of Ssu-ch'uan. Other evidence leads to the conviction that the Shans formed part of the early Chinese horde. Thirty per cent of their vocabulary is Chinese. The Lao Shans were settled in the country west of Tong-king at a very early date, and had wedged themselves into the Yun country, as far south as Vien Chang, before the arrival of the Yun Shans in the valley of the Menam. The name given to them by their neighbors, Lau or Lao, means ancient or old. The Yun Shans had founded towns south of Yunnan long before the time of Gaudama, and were pushing down the valley of the Mekong through the Yun or Karen country. These Karens, there is reason to believe, were the earliest Chinese emigrants, for a long period they ruled over the country of Youe-Chang (Tchen-Tching, Lin-y, or Lam-ap), and in the fourth century over Cambodia. In A. D. 431 the Yun Shans founded several cities in the valley of the Menam, and by 707 had overrun and occupied the northern half of Cambodia.

Early in the sixth century B. C., the Mau Shans entered the valley of the Irrawadi, and drove the Burmese tribes to the southward. About A. D. 1220 they annexed Assam, and became predominant over the Shan States east and west of the Salween as far south as Zimmé. By the end of the thirteenth century they had shattered the Burmese empire, driven the Yun Shans to Chaliang, from whence the latter descended and founded the kingdom of Siam, attacked Java, Malacca and Cambodia, annexed part of Pegu, and extended their sway over the Malay Peninsula as far south as Lavoy. From this time to 1554, Shan princes ruled in the valleys of the Irrawadi, Sittang and Salween, as well as in the country south of Yunnan, as far east as Cochin China.

Anam, or Upper Cochin China.—According to M. Labarthe (*Rev. de Geographie*, Sept., 1883), Anam is but a strip of hilly uncultivated country lying between the ocean and mountains that border the basin of the Mekong. Unhealthy, and scarcely capable of producing rice enough for its inhabitants, it is entirely dependent upon the supplies and finances drawn from Lower Cochin China and Tong-king. The loss of the former is a severe blow, that of the latter will be the fall of the Anamite power. The most fertile portion is the province of Binh-dinh, midway between Saigon and Hue, the ancient stronghold of the once powerful Tsiampas, who for ten centuries kept the Anamites in check. In this province there are more than five hundred villages and fifty

or sixty markets. The capital and citadel of Binh-dinh may have ten to twelve thousand inhabitants. Near it is the port of Thinai, the ancient Gia, by error called Qui-nhon on the French maps. The area of Anam is probably about 47,000 square miles. The capital, Hue, was created by the Anamite Emperor Nguyen-Anh. It has a huge citadel, but the town, according to M. Aubry, does not contain more than 40,000 people.

AFRICA.—Mr. J. Stewart has made important geographical discoveries in the upland region between Lakes Nyassa and Tanganyika. On an expedition westward to Mt. Mapurumuka, he passed in two days march the affluents of the Songwé, flowing to Lake Nyassa, the Loangwa flowing to the Zambesi, and the Chambezi flowing to Lake Bangweolo. The source streams of Chambezi were found to be 934 feet above the lake, and form a considerable river by their union. Further along the road to Tanganyika other streams flowing to the Chambezi were found at a level of 500 to 600 feet above the lake, so it is inferred that a portion of the lower course of the river is navigable.

Mr. J. T. Last (Proc. Roy. Geog. Soc., Oct.) gives a graphic description of the tribe, or rather the remnant of a tribe, known as the Wa-itumba. The coast tribes (Warima) assisted by the Wa-lori, overran the whole of the district formerly inhabited by the Wa-itumba, so the Humba and Mamboia mountains are now but very thinly settled, though numerous sites of decayed villages, with their plantain-trees, remain to tell the tale. The Humba hills consists of five ranges lying between 6° 30′ and 7° S. lat. and 36° 30′ and 37° E. long. The hills have few trees, but are covered with tall coarse grass, while between each range is a valley with one or more rivers fed by numerous streams. The Wa-itumba are tolerably tall, and of muscular build, owing probably to their work as iron-smelters and forgers. They are far superior to the surrounding agricultural tribes in acuteness, ingenuity and barter, and in appearance have very much in common with the sooty foundrymen and blacksmiths of more civilized communities. The ore is found in three places between the third and fourth ranges of hills, and is obtained from a layer of red clayey sand by washing away the light sand in a successive series of pits, and then by fanning so as to separate the small stones from the heavier particles of iron ore. The sand probably contains five per cent of ore. This part of the work is usually performed by the women. The clayey sand is obtained about two feet below the ground. The smelting is done with charcoal, made by the men for the purpose, and is carried on in a pit. To keep up the blast, bellows are made of wood and skin, with a wooden tube; and clay pipes, moulded on a bamboo about two and a half inches in diameter and five feet long, are used to convey the blast to the furnace. The fire is fed alternately with charcoal, and ore, and three sets of bellows

are used. The result is a mass of impure iron, which has to be again smelted to consume the charcoal within it, and is then heated again and hammered into hoes. The smelting is done in a round hut with a steep high roof, but all the blacksmith's work is done in the open air. The neighboring Mangaheri are a timid, peaceable people inhabiting a district some thirty-five miles long by fifteen wide between 6° 20′ and 6° 40′ S. lat. and 37° to 37° 40′ E. long. Every man is more or less a blacksmith and can forge hoes, swords, hatchets, arrow-heads, spears, etc. The women do most of the gardening, but men do the rougher bush-cutting, and join in the harvest. After harvest, much *pombe* or beer is drank. Two yards of calico is the usual dress of both sexes. The houses of these tribes are of two kinds, *misongi* or round huts, and the more substantial but dismal and dirty *tembe*. A tembe consists of crotched posts inserted in holes about two feet apart. Two rows of these posts are set up at a distance of about nine feet from each other, a pole is laid along the crotches of each row to serve as wall-plate, and the two rows of posts are connected by poles from wall-plate to wall-plate. The space between the posts are filled in with small wood, bound with a wild creeper, and packed with wet clay. The roof is made by covering a mass of smaller posts, branches and grass with about two feet of dry beaten clay. A doorway never more than four feet high and two wide and some small round holes to look out at, are left in the sides.

Mr. Stanley returned in August from a journey to the mouth of the Ikelemba or Kassai, where he founded an advance station. Lieut. de Brazza's expedition is said to be at a standstill on the Upper Ogowé. By the upsetting of a canoe while crossing the Congo at Msuata, Lieut. Jansen and the Abbè Guyot were drowned, together with eight of their eleven Zanzibar men.

The African traveler, Ernst Marno, died at Fazogi, on the 17th of August last, while on his way to Europe to recruit his health. He was only 39 years of age.

GEOGRAPHICAL NEWS.—An expedition despatched to New Guinea by the proprietors of the Melbourne *Argus* has returned to Queensland. Its members suffered from fever, and one, Professor Denton, died.——Dr. Fisher, when about six days march from the semi-mythical inland sea of Lake Bahringo, was compelled to return by a force of 3000 Masai warriors. He has made large collections, including many species new to science.——Capt. C. E. Foot, R. N., has been appointed British Consul for the Lake district of South Central Africa, and will endeavor to enter into friendly negotiations with the native chiefs.——M. Flegel is preparing to travel from Abudja, near Onicha on the Niger, via Adamawa, to the Congo, and Lieut. Wissman has been engaged by the International African Association to command a new expedition in the basin of the Congo.——The Italian traveler, Sac-

coni, sent out by the Milan Geographical Society, was murdered by the Somalis on August 5th. The Sultan of Ogaden had warned him not to proceed on account of the state of war that prevailed, but Sr. Sacconi continued onward until he was surrounded by 5000 men. In the course of the night five Somalis suddenly attacked the traveler's tent while the guards were asleep and killed Sr. Sacconi with their knives. All his notes are lost, and his diary burned.——Captain Dawson and party, of the British Circumpolar Expedition, which wintered at Fort Rae, arrived safe and well at Winnepeg on Nov. 2.——Lieut. Hovgaard, in reply to an inquiry from Baron Nordenskjöld, states that he could have navigated the Kara sea and reached the Yenisei last year had he not, by signals of distress from the *Varna*, been compelled to leave the lead along the shore of Waigatz island. The lead was open as far as the eye could reach.——In the vicinity of Bona, Algeria, the Naiba, an isolated mountain 800 meters high, is gradually descending into the earth, forming a deep excavation round the sinking mass.

GEOLOGY AND PALÆONTOLOGY.

RESULTS OF THE DEEP-SEA WORK OF THE "TALISMAN."—M. Alphonse Milne-Edwards has communicated to the French Academy some preliminary reports of the results of the work of the deep-sea explorations conducted by the French government during the past season. The work was carried on from the Gulf of Gascony to the Cape Verde islands, and then north-westward to the Sargassum sea, north-eastward to the Azores, and back to France. As far south as the exploration extended, the great depths were found to be occupied by an arctic fauna, totally distinct in character from that inhabiting the lesser depths. The difference, says M. Milne-Edwards, is like that distinguishing the faunæ of distinct geological horizons. Between the Azores and France the bottom is covered with deep white slime composed of the shells of Globigerina. Fragments of pumice and other rocks are common, some of the latter containing fossils, among others Trilobites. There were also found, 700 miles from the coast of France, polished and striated pebbles of glacial origin, which M. Milne-Edwards thinks were dropped there by icebergs.

These discoveries show how transpositions of faunæ which present different chronological characters, such as the occurrence of Barrande's colonies, may take place. Oscillations of the ocean bed or shore on a sufficient scale are all that is necessary. Elevation of the ocean bottom sufficient to connect New Guinea with Celebes or Borneo, would give the same result, a Mesozoic or Eocene mammalian fauna would supervene on a modern one. The invasion of North America during the Pliocene period by the South American Edentata, was a case of an inferior fauna succeeding a superior one.—*E. D. Cope.*

THE EOCENE FAUNA OF PATAGONIA.—In a recent issue of the *Revue Scientifique* M. Trouessart gives an account of the Eocene fauna of Southern Patagonia. The great discoverer in this direction has been Señor F. P. Moreno, of the Buenos Ayres Museum, who, with five persons and a canoe drawn by horses, ascended the Santa Cruz river beyond the point reached by Darwin, and discovered lakes Argentine, Viedma and San Martin, all fed by the glaciers of the Andes. The middle course of the river, though desolate as the lower, is grander, and the outlines of the hills at once reminded Sr. Moreno of the *Mauvaises Terres* of Nebraska and New Mexico. The upper course traverses the great forest of beeches that has replaced the palms of the Tertiary epoch, and the richness of the flora contrasts greatly with the aridity of the lower regions. In a little cavern was found the mummified body of a man, wrapped in feathers of the rhea and painted like the mummies of Arizona. This mummy marks the previous existence of a people less barbarous than the scattered tribes that now inhabit the country.

On the left bank of the middle course, at a point passed but not noticed by Darwin, was discovered the rich fossiliferous beds, the treasures of which now enrich the Museum of Buenos Ayres. The current is so rapid and the stream so narrow at the passage of this formation, the beds of which are almost vertical, that it is no wonder that Darwin's attention was otherwise occupied when passing. These difficulties caused the collections made by Sr. Moreno to be far smaller than they would otherwise have been.

One of the principal remains is a large skull, incomplete anteriorly; this skull was described under the name of *Astrapotherium patagonicum* by Burmeister. According to Señor Moreno the upper surface is convex; there are no horns, and while enormous canines are present, there are but three or four molars or premolars on each side of the upper jaw. It presents very generalized characters, its only molar is marsupial, while the form of the skull approaches that of the carnivores, so that it may be supposed to be a great transitional marsupial of aquatic habits. The brain is very much reduced. Another species is a true marsupial which Sr. Moreno has described under the name of *Palæotenthes aratæ*. The same locality has furnished a portion of the mandible of Owen's *Nesodon imbricatus*, and two molars of *Toxodon patagoniensis*, both from a more modern horizon than Astrapotherium. In the same bed with Toxodon, Sr. Moreno has found also the skulls of two smaller animals, which together constitute a complete transition between the toxodonts and the rodents. One of these is named *Toxodontophanus australis*, while the other, nearer to the rodents, is styled *Interatherium rodens*.

Tembotherium holmbergii is a true rodent from the Santa Cruz beds. M. Lista, in his voyage to the sources of the River Chico,

had previously found a cranium of an Anchitherium, as well as of Nesodon. Dr. Cunningham had discovered in the Lower Tertiary of the Gallegos river an ungulate described by Flower as *Homalodontherium cunninghamii*, and d'Orbigny had found the rodent-like *Megamys patagoniensis*. Two molars, with a fragment of skull, discovered by M. Moyzes in a bed which is believed by Sr. Moreno to form the passage from Cretaceous to Tertiary, might have belonged either to a gigantic capybara or a small elephant, and formed part of what is probably the oldest known South American mammal. Sr. Moreno has named it *Mesotherium marshii*.

Dr. Cunningham was the first to find remains of Edentata in the Tertiary, by the discovery of some plates of a Glyptodon on the Gallegos river. In the upper horizon of the Santa Cruz beds Sr. Moreno has found fragments of the cuirass of *Hoplophorus australis*, and the Museum of Buenos Ayres has the humerus of a Mylodon from a Tertiary deposit near the Rio Colorado.

In the Bay of Santa Cruz, at the base of the marine Tertiary, Sr. Moreno found the skull of an enormous cetacean so firmly imbedded in the rock that he could only extricate the cervical vertebræ and a portion of the occipital region. This species he has named *Palæobalæna bergii*. Remains of another cetacean species, *Saurocetes argentinensis*, were also found, as well as fragments of some dolphins, of some seals from the Chubut river, and of birds, etc. The discovery of these remains tends to show that the Tertiary fauna of Patagonia preceded that of the Argentine Republic, and if the list of the Patagonian Tertiary fauna is small, it is probably because it is as yet incomplete.

It was previously supposed, on the faith of the observations of d'Orbigny, Burmeister and Darwin, that Patagonia was entirely composed of marine Tertiary deposits, but it is now demonstrated that terrestrial and lacustrine deposits are largely represented.

The presence of so rich a Tertiary fauna in Patagonia lends weight to Sr. Moreno's opinion that at the commencement of this period a southern continent existed, spreading over the present bed of the Atlantic and Pacific, and that the fauna of this country spread northward towards the equator at the time when the glacial epoch had set in in Southern Patagonia. Traces of local emersions and immersions, as well as traces of an abundant vegetation advancing to the sea, occur in many points of Patagonia, which at that period evidently enjoyed a warmer climate. At the present time the southern point of the South American continent appears to be slowly sinking, and soundings in the Atlantic show that a rise of less than 150 meters would unite the Falkland isles and Tierra del Fuego with the continent, which would then, at the latitude of the Santa Cruz river, have the width of Africa at Orange river. A further rise of 2000 meters would unite this land with South Georgia and other antarctic lands, and the kind

of hook towards the east formed by Tierra del Fuego and Staten island, indicates the direction of the crest of this submerged continent. This subsidence of Patagonia, following an elevation which has left salt lakes with still-living marine species 200 feet above the sea, is balanced by an elevation to the north of the Rio de la Plata. There the same upward movement of submarine formations which has caused the canal to the east of the Patagonian Andes to be abandoned by the sea, while that to the west parts off a chain of multitudinous islands, is now in operation farther north. Modern alluvium, formed by great lakes fed by the melting glaciers, have filled up the old sea-canal to the east of the Patagonian Andes. An alternation of partial subsidences and elevations, such as are now acting, allowed the fauna to persist, and caused that alternation of marine and terrestrial beds which is observable.

Towards the middle of the Tertiary period, the two Americas were as yet disunited, Southern Brazil was a great island, the ocean filling the basins of the Amazons and the La Plata; the mass of the Columbian mountains stretched to the north, while Bolivia and Patagonia, now separated from the southern continent, formed a vast peninsula. The numerous groups of islands dotted over the Pacific seem to be the remains of the submerged continent which united Australia to South America. According to Hooker, not less than seventy-seven species of plants are common to New Zealand, Tasmania and South America, whilst very few cosmopolitan genera are common to these regions. The presence of marsupials is another link between Australia and South America.

Probably Australia was parted off at the end of the secondary period, while South America was still a portion of the southern continent. The marsupials were thus divided and evolved separately in their two seats, while in the Miocene the edentates appeared in Patagonia.

The red sandstone, probably Cretaceous, which occurs in the triangle formed by the rivers Limay and Neuquen, and contains the remains of Mesotherium, is probably the oldest formation known in Patagonia, and extends over a large area to the south and south-west. An ancient shore near Lake Argentine proves the subsidence of Patagonia toward the end of the Tertiary period.

Sr. Moreno believes that the present relief of Patagonia is the result of volcanic eruptions which, towards the end of the Tertiary, were repeated from Tierra del Fuego to Brazil. Under the influence of these Patagonia rose again, but the antarctic ice had advanced and the land was glaciated. The pampean formation is the result of the far-spreading glaciation produced, in Sr. Moreno's opinion, by astronomical causes, and the remains found in it were carried by the ice from more southern parts—not a single complete skeleton is found in the true silt of the lower pampean.

The cold spread northwards to Chili, Bolivia, even Brazil, and most of the animals perished. A few of the hardiest, as the guanaco, llama, vizcacha, puma, armadillo and rhea again spread southwards when the glacial era passed, but the great edentates found neither the mild climate nor the abundant vegetation that suited them, and remained in the as yet marshy pampa. At this epoch the mastodons which had penetrated by the Isthmus of Panama, appeared upon the scene. The extinct fauna found in Patagonia must be that indigenous to the country, for since no animal leaves its country unless forced thereto by the struggle for life, it is unlikely that Brazil and Bolivia were abandoned for desolate Patagonia.—*Dr. Trouessart in Revue Scientifique.*

Schlosser on Anoplotherium.—Herr Schlosser, of Munich, has dispelled the uncertainty respecting the relations of the genera Anoplotherium and Eurytherium. He finds that the peculiar second digit of the hind foot which characterizes the latter, belongs as well to the former, and that the name Eurytherium is a synonym. This digit, extending nearly at right angles to the others, was probably connected with them by a web, according to Schlosser, who agrees with Cuvier that the habits of these animals were aquatic. He refers three genera to the Anoplotheriidæ, with the following numbers of species. Anoplotherium Cuv., three sp.; Diplobune Fraas, three sp; Dacrytherium Filh., one sp.

Elevated Coral Reefs of Cuba.—Mr. W. O. Crosby (Proc. Bost. Soc. Nat. Hist.) describes the elevated coral reefs of Cuba, and from them draws inferences adverse to those drawn by Professor A. Agassiz from examination of the Florida reefs. Four coral terraces extend, with slight interruptions, round the entire Island of Cuba. In the western part of the island they are the predominating formation, and are well preserved on the summits of the highest hills, but further east erosion has been more rapid. The lowest terrace, on the northern side of the island, rises thirty feet, the second rises abruptly 200 to 250 feet above it, the third is about 500 feet high, and the fourth has a height of probably not less than 800 feet near Baracoa. Five miles west of Baracoa 1000 feet of the upper part of a mountain is reef limestone and originally the formation must have been 2000 feet thick. The thickness of the reefs here and upon the Island of Jamaica, where the elevated reefs reach a thickness of 2000 feet, is considered by Mr. Crosby to prove that they were formed in shallow water during a period of slow subsidence, according to the theory of Darwin.

There does not appear to be any reason to doubt Mr. Crosby's conclusions in this case, neither does there appear to be any reason to doubt those of Professor Agassiz in that of the Florida reefs. The latter authority does not endeavor to set aside the

theory of Darwin, but to show that in some cases, at least, coral reefs are but the summit of an elevation formed by other agencies. In cases of subsidence the reefs are thick, while in regions of elevation, as in Florida, the coral reef is but a thin crust topping a bank of deposited matter.

MINERALOGY[1].

GRODDECKITE—A NEW ZEOLITE.—A. Arzuni describes a zeolite from St. Andreasberg, in the Harz, which, while closely resembling gruelinite in form and physical properties, contains iron and magnesia in place of pativis of the aluminum and lime, and is to be regarded as a new variety of gruelinite. It is described as occurring in small crystals upon calcite, containing in their form the rhombohedron, scaleushedron and hexagonal prism, and possessing a prismatic cleavage, and a hardness of between 3 and 4. The composition is:

SO_2	Al_2O_3	F_2O_3	CaO	MgO	Na_2O	H_2O
					(by difference)	
51.2	12.0	7.7	1.1	3.8	4.5	20.2 = 100

and the formula

$$(Mg\ Na_2)_2\ (Al_2\ Fe_2)_2\ S_9\ O_{26} + 13\ H_2O$$

is adduced, the mineral being regarded as a magnesia-iron gruelinite.

It is named from Dr. A. von Groddeck, the director of the museum at Clausthal, in which the specimen was found.

HERDERITE FROM MAINE.—Mr. U. E. Hidden, well known for his mineralogical discoveries in North Carolina, announces[2] the probable occurrence of the rare mineral Herderite at Stoneham, Maine. The crystals are short, truncated prisms, transparent to translucent, colorless or faintly yellowish. Hardness 5, sp. gravity 3. The crystals are orthorhombic with $I \lambda I = 116°$ It resembles topaz in form and color, but has neither the cleavage nor the hardness of that mineral. An analysis is now being made. Professor E. S. Dana gives some crystallographic measurements which closely approximate the angles of herderite.

RECENT METEORITES.—A large meteorite fell last February near Brescia, Italy. It was about half a metre long and of a conical shape. It buried itself a metre deep in the earth, singeing the grass in the neighborhood, and when dug out was still warm, and the smell of sulphur was distinctly noticeable. Although the meteorite passed through the air in a S. S. E. direction, it forced its way into the earth obliquely in an opposite direction.

About a year earlier, in February. 1882, a great meteor burst in a cloudless sky in Transylvania. A large ball of fire seen through-

[1] Edited by Professor H. CARVILL LEWIS, Academy of Natural Sciences, Philadelphia, to whom communications, papers for review, etc., should be sent.

[2] *Am. Jour. Sci.*, Jan., 1884, p. 73.

out western Transylvania suddenly burst, and three minutes after its disappearance a series of detonations was heard. The path of the meteor was for a long time marked by a grayish-white cloud. Some 3000 stones fell, the largest of them weighing over 38 kilogrammes. Analysis showed that they were stone meteorites containing a percentage of 9.88 nickel-iron, 6.63 magnetic pyrites and 83.49 silicates.

THE FELDSPARS.—Speaking of the importance of a correct determination of the feldspars, J. Szabo[1] remarks "that it is the unanimous conviction with petrographers that every kind of a rock mass can be best determined by the mineral association found in it, and of all mineral it is the kind of feldspar which is most important. There was a time when we had been contented to say feldspar generally; then came a time when we said orthoclase and plagioclase; but now we know that this is not enough; we must discern among the plagioclases according to their basicity, at least an oligoclase-andesite, a labradorite, and a bytainite-anorthite." He states that in the case of an eruption, the most acid feldspars are the first product of eruption and the most basic the last, and that in many cases "the determination of the feldspar is the only possible way of saying something of the lithological and chronological character of the rock in question."

In order to determine the feldspar in the quickest way, he recommends flame experiments, and describes his method of work. It is based upon the coloration of the flame of a Bunsen burner by potash and sodium, and upon the degree of fusibility of the different feldspars, both being observed in the same experiment. A grain of feldspar of the size of a mustard seed is placed upon a loop of very thin platinum wire, and introduced into different parts of the flame. He distinguishes *seven* degrees of fusibility from Bronzite (1) to Stibrite (7), in each case holding the grain in the flame for one minute, and noting the degree of fusion. "Sodium is the element in the silicates which makes them easily fusible, the magnesium and aluminum render them less fusible or altogether infusible."

As to the coloration of the flame, he uses a solution of indigo in sulphuric acid, through which to observe the coloration by potash, and discovers five degrees in the yellow flame of sodium, and three degrees for the red flame of potash, the intensity of coloration depending upon the percentage of the alkali.

By combining these observations with an examination of the character of the fused globule, it is claimed that all the principal feldspars can be racognized. It is doubtful, however, whether a careful lithologist, unless made confident by long practice, would be sure of his determination by this method. The almost universal occurrence of a mixture of two or more feldspars renders any

[1]Proc. Amer. Assoc. Adv. Sci., XXXI., 270, 1882.

such method uncertain. Descloiseaux, in a recent paper,[1] has shown that although albite is the most constant of all the feldspars, it is subject to great variations, both as to homogeneity and optical characters.

Tschermak holds that the soda-lime feldspars are all mixtures of a soda feldspar with a lime feldspar, the proportions varying to form a continuous series from a pure soda feldspar (albite) to a pure lime feldspar (anorthite). Probably the only perfectly pure albite ever found occurs at Kasbék, Caucasia, where, according to Baerwald,[2] is a feldspar in which is no trace of lime or potash, and whose angles and specific gravity are almost identical with those calculated by Tschermak as belonging to a theoretically pure albite.

PSEUDO-SYMMETRY.—In the new edition of Pisani's excellent "Traité élémentaire de Mineralogie," the subject of pseudo-symmetry is treated substantially as follows: After referring to the labors of mineralogists by means of the polarizing microscope upon the internal structure of certain minerals, such as analcime, boracite, some garnets, etc., generally regarded as isometric, but shown optically to belong to another system; and after referring to similar researches upon crystals of the tetragonal, hexagonal and orthorhombic systems, such as idoclase, certain corundums, etc., which have led to the conclusion that the exterior envelope of all these crystals is the result of the grouping of interior polyhedrons arranged geometrically around a point; he remarks that these phenomena may be explained in most cases by an interior molecular transformation taking place *after* the formation of the crystal.

He states that it is only certain garnets from particular localities that have an anomalous structure, and that it is a singular fact that in no case does the external shape of pseudo-symmetrical crystals approach the form indicated by their interior system.

While admitting that the interior structure of a crystal may indicate another crystalline system than that generally admitted, Pisani recommends that each species should be placed in the system indicated by its *geometrical* form, at least until some more convincing proof to the contrary has been adduced.

MINERALOGICAL NOTES.—A new locality for topaz has been discovered near Platte mountain, Colorado, about twenty-five miles north of Pike's Peak. The crystals occurred in a pocket in decomposed albite. The topaz is either colorless or has a pale straw-color. Some of the fragments found indicated from their size the occurence of very large crystals. Associated with the topaz were crystals of microcline, gœthite, fluorite, etc. The largest microcline crystal found measured eighteen inches in the

[1] Bull. Soc. Min. de France, VI, 89.

[2] Zeitsch. f. Kryst., VIII., 48.

largest diameter.——E. Claassen has described some interesting crystals of pyrite from Parma, Cuyahoga county, Ohio. They form combinations of the cube, octahedron and pyritohedron, the cube predominating. The interesting feature of the crystals contists in the fact that the cubic planes are *concave*, the other faces being flat as usual. Some of the combination edges are therefore curved lines. The author supposes that the concave planes are the result of subsequent growth over a smaller normal crystal. It is more probable, however, that the raised edges are due to the more active growth which always occurs at the edges of planes, and which renders the edge harder than central parts of the planes. In quartz crystals the edge is often raised above the interior, and the same occurs in imperfect crystals of alum, salt, etc. The edges are first formed, and if the solution is exhausted, the planes are very apt to be concave.——Kosmann has published a description of the minerals of the ore deposits of the Muschelkalk of Upper Silesia. In addition to the various ores of zinc and manganese which are described at length, mention is made of an interesting discovery of a bed of asphalt in the deep workings of the Friederich's mine.——Now that asbestos in the many forms in which it is manufactured, is so largely used in mines, factories, furnaces, mills, steamships, etc., the demand for the raw material is great. Asbestos suitable for manufacturing purposes is not common. Even though the mineral may look well to a mineralogist, it may be worthless to the manufacturer. Not only is length of fiber necessary, but a certain toughness and elasticity is requisite, which many specimens do not possess. If it is at all altered or " rotten," it is without value.——Larger quantities of horn silver occur in Arizona, the ore being horn silver and native silver occurring in syenitic gneiss. Many mines have been opened, and many millions of dollars of silver already extracted. In a mine recently opened in the Turkey Creek district, $60,000 worth of silver was obtained in the first fifty feet sunk. Argentiferous sulphuret of copper has been discovered in Yavapai county, yielding copper and silver in abundance.——Rubellan has been shown by Hollrung to be an alterative product of magnesian micas, very variable in composition, by no means homogeneous, and certainly not entitled to a distinct name.——The Zircons found near Pike's Peak, Colorado, are very pure and transparent, and are occasionally of a deep emerald-green color.——Geinitz has described a pseudomorph of nacrite after fluorite, in which the nacrite partially filled a crystal of fluorite.——A *chromium diopside* has been found in the diamond mines of the Cape.——The blue color seen in some varieties of halite has been investigated by Wittjen and Prechi, who conclude that it is probably due to the presence of minute gas inclusions, producing the optical effect.——An examination of a boiler incrustation from Zwickau, proved that the main constituent was magnesium hydroxide, or *brucite*.

BOTANY.[1]

POPULAR BOTANY AGAIN.—Some months ago, in commenting upon Step's "Plant Life," we referred to the duty which every scientific man owes to his country, to present the leading facts of his science in the language of the people.

We wish to reiterate the sentiment, feeling that in so doing we are aiding the cause of scientific and technical botany. We hold the more eminent a worker in science becomes, just so much the more is it his duty to appear before the world as an instructor who may speak "as one having authority." The world is full of men who write for the people, but who themselves have not seen the things whereof they speak. That they have readers, shows the longing there is among the people for a knowledge of scientific matters. Why should not every man who brings to light an important fact in any department of science, himself publish it to the world at large, instead of permitting another to do so "who has simply been standing at the door of the temple?"

The wonders of plant life ought to afford material for many a popular book, popular in the best sense of that much abused word. It is greatly to the credit of the people who read popular books, and who listen to popular lectures, that both authors and lecturers find it profitable to assume to have themselves seen the wonderful things of which they speak. There is a hint here for genuine workers, for the men who have all their lives been familiar with Nature's mysterious workings. If the man who makes a hasty excursion into the domain of Nature, and fills up his fragmentary and superficial observations by cramming from some standard volume, is so eagerly listened to, how much the more will he be who is able to draw from long years of personal experience the material of his narration.

Some time ago Miss Herrick prepared a few papers for *Scribner's Monthly* upon some of the curious and interesting things which the microscope had revealed to her in the world of plant life. She has now brought these together and added a few others under the title of "Wonders of Plant Life,"[2] which the Putnam's have brought out in one of the tastiest little volumes which it has been our good fortune to examine for many a day. We have first a chapter on the beginnings of life, in which many things as to protoplasm and plant cells are pleasantly spoken of; then follows a chapter on single-celled green plants, treating principally of diatoms, and a third on fungi and lichens, a fourth on liverworts and mosses, a fifth on ferns. The remaining chapters take up in order the physiology of plants, corn and its congeners, the microscope among the flowers, pitcher plants, and insectivorous plants.

[1] Edited by PROF. C. E. BESSEY, Ames, Iowa.

[2] The Wonders of Plant Life under the Microscope. By Sophie Bledsoe Herrick. New York, G. P. Putnam's Sons, 1883. 284 pp. 16 mo.

All the way through the author has introduced drawings from specimens of her own preparations, and these, with those copied from Sachs, Carpenter, Darwin and other sources, bring the number of illustrations up to eighty-five. Some of these are quite good, while others, we are sorry to say, are sadly deficient in that very desirable quality—accuracy.

Now this book is one from which, as a text, two separate sermons might be preached. From one standpoint it is to be commended, while from another it must be severely criticised. It is commendable in that the author has wrought into it so much of her own observation and work; it is to be criticised in that there are so many grievous errors which mar what would otherwise have been a delightful little book. We are sorry to have to say it, but there is not a chapter which does not contain erroneous statements. We are all the more sorry to have to say this, because of the evident good faith and desire on the part of the author to represent the several subjects treated of as they are understood by modern botanists. Had the manuscript (and some of the drawings) been submitted to some one more familiar with the subject, many of the errors might have easily been eliminated. For example, on page 73 we read "Mildew, which is so destructive to cotton and linen fabrics, etc., etc.," and we are then referred to "Fig. 20 A." Upon turning to the figure we find a poorly copied drawing of wheat rust (Puccinia)! The blunder, for such it is, comes from the fact that in England wheat rust is called mildew, but our author ought to have known that what she referred to is a very different thing. On page 133 we have an illustration of the truth of the adage "that a little knowledge is a dangerous thing." Here we read that "lateral shoots, vegetable hairs, and leaves are exogenous, or proceed from a layer of growing cells just underneath the bark," a statement which bears evidence of an entire misunderstanding of the term exogenous in this connection. It is needless to cite further examples. May we not hope that the publishers will authorize an early revision, in which the errors will be eliminated?

Genera Pyrenomycetum Schematice delineata. By P. A. Saccardo, Patavii, Nov. 1883.—This latest work of the well-known mycologist of Padua, consists of fourteen lithographic plates, large 8vo, on which are illustrated the 280 genera into which the Pyrenomycetes are divided, according to the system of classification adopted in the two volumes of the Sylloge by the same author. The figures, though not claiming artistic perfection, are very good and answer admirably the purpose for which they were intended. They give in fact "a bird's eye view" of this vast family of fungi and may be considered as indispensable both to the amateur and the critical student of mycology. It is noticeable that in this new arrangement, the name Sphæria, under which

all these forms were once included, has, as far as any generic significance is concerned, entirely disappeared, being retained only to designate the 420 species (enumerated on pp. 367–543, *Syll.*, vol. 2) whose fructification is unknown. Whether this new classification, founded principally on the color and septation of the sporidia, will finally be accepted, remains to be seen. By the mycologists of continental Europe it is already adopted, while the English mycologists, under the leadership of Dr. Cooke, are raising some objections which are worthy of consideration.

The old classification of the Sphæriaceæ has already been essentially modified and is destined yet to undergo still further changes. The only question seems to be concerning the nature and extent of these changes.

In making innovations on any old and well established system, the tendency is always to extremes, and the new definitions proposed are finally accepted, rejected or modified in accordance with the conclusions deduced from more mature deliberation, and this no doubt will be the case with the new carpological system so ably advocated and finely illustrated by the learned editor of the *Sylloge*.

The objections urged against this system are, in brief, that forms evidently closely allied are widely separated. For example, the old genus Melanconis is limited to the species with uniseptate hyaline sporidia and stands in the sect. Hyalodidymæ, while the species with uniseptate brown sporidia constitute the genus Melanconiella in the sect. Phæodidymæ, and the species with brown sporidia having three or more septa are placed in the genus Pseudovalsa in the sect. Phæophragmiæ, the mode of growth in all these three forms being essentially the same, *i. e.*, perithecia more or less distinctly circinate in a definite stroma. It cannot be denied that the carpological system of classification has merits not to be disregarded or hastily rejected, and it is probable that with some modification it will yet be universally adopted. Meanwhile, whatever may be the final conclusion, students of mycology everywhere will be glad that with the two volumes of the *Sylloge* and the "Genera Pyrenomycetum" they may now with reasonable certainty determine the various species of Sphæriaceous fungi within their reach.—*J. B. Ellis, Newfield, N. J., Dec. 10, 1883.*

New Florida Fungi, III.—*Isariopsis clavata*, E. & M.—Bundles of fertile hyphæ about 5^{mm} high and 30–40μ. thick, composed of loosely compacted threads divergent and subundulate above and bearing at their tips single oblong-fusiform brown 3-septate conidia, 18–22 × 5–6 μ. Many of the component threads terminate in free, divergent ends, these free ends also bearing conidia. There is also a prostrate hypha, like that of Meliola, forming orbicular patches from which the upright hyphæ arise. On living leaves of *Persea palustris.*

The above described species were collected at Green Cove Springs, Florida, during the winter of 1882–3, by Dr. Martin.

To these may be added the following species collected at various places:

Phyllosticta fraxini E. & M.—Spots light brown with a dark purple border, ½–1^{cm} in diam., perithecia epiphyllous, scattered, lentiform, black, (150μ); spores oblong, or oblong-elliptical, hyaline, 1–2 nucleate, 7–9 × 2½–3μ. On leaves of Fraxinus, Del. Co. Pa. Dr. Martin; and Bethlehem, Pa., E. A. Rau.

Phyllosticta catalpæ E. & M.—Spots pale brown, circular, 5–7^{mm} diam., border darker; perithecia few scattered, often sterile, brown, lenticular, innate, epiphyllous, 112 × 84μ; spores subhyaline, oval, 5–7 × 2½–4½μ. On leaves of *Catalpa bignonioides*. West Chester, Pa., August, 1883.

Ramularia orontii, E. & M.—Spots large, pale brown, border darker; hyphæ epiphyllous, hyaline, 30 × 3μ, apices mostly bifid; conidia hyaline, numerous, oblong, with the ends rather acute, uniseptate, 18 × 4μ. On leaves of Orontium. Newfield, N. J.

Ramularia andromedæ E. & M.—Hypophyllous, forming dull white orbicular patches about 1^{cm} diam., with a red-brown spot of the same extent on the opposite side of the leaf; hyphæ, simple or branched, continuous, 30–40 × 3μ; conidia oblong or cylindrical, 10–20 × 1½–2μ, continuous or uniseptate. On leaves of *A. racemosa*. Newfield, N. J.

Cercospora perseæ, E. & M.—On reddish-brown irregular-shaped spots ¼–1^{cm} diameter, with a dark but not raised border; hyphæ epiphyllous, densely cæspitose, brown, faintly septate, bent and geniculate above, apices subdenticulate, 55 × 4μ. Conidia slender clavate, 3–4 septate, 100 × 3μ. On leaves of *Persea palustris*.

Cercospora heucheræ E. & M.—Spots brown, mostly round (4–5^{mm}), border obsolete; hyphæ fasciculate, flexuous, light brown, mostly hypophyllous, 30 × 3–4½μ; conidia subhyaline (light straw color), cylindric-clavate, septate, 60–75 × 3μ. On leaves of *Heuchera americana*. Chester Co., Pa.

Macrosporium Martindalei E. & M.—Hypophyllous on pale round spots, ½–¾^{cm} diam. on living leaves of *Magnolia glauca*. Hyphæ erumpent, cæspitose, geniculate, multiseptate, 50–80 ×5; conidia 35–50 × 18–22μ, about 3-septate at first, becoming muriform and dark brown; pedicels 20–50μ long, often wanting. The hyphæ form tufts nearly black, arranged in a circle about 3^{mm} in diameter. Occasionally the fungus appears on the upper side of the leaf. The spots on the upper side of the leaf are much darker with a more distinct border and show a dark discolored speck in the center, in which is often found a small white larva about ⅛ of an inch long, apparently hatched from an egg deposited by some insect, which thus causes the dead spot in the leaf on which the

fungus grows. This curious species was discovered by Mr. Isaac C. Martindale, while on a visit to Newfield, Sept. 23d, 1883.—*J. B. Ellis, Newfield, N. J., and Dr. Geo. Martin.*

LABORATORY HELPS.—About two years ago the German edition of Pôulson's little manual, *Botanische Mikrschemie*, made its appearance in this country, and was at once placed upon the list of necessaries in the botanical laboratory. Professor Trelease has rendered an excellent service to botanists by translating the work, adding somewhat to it, and causing it to be published in this country. It appears under the title of Botanical Microchemistry, and is published by the well-known Boston house of Cassino & Co. The scope of the work may be understood from the principal topics noted in the table of contents, viz: Microchemical reagents and their application; mounting media and cements; vegetable substances and the means of recognizing them. It is in substance just the book that every laboratory student has been wanting to have at hand for a long time. We regret that the publishers did not print it upon thinner paper. As it is it will be necessary to break the binding before the book will remain open upon the laboratory table. It should have been printed upon thin paper, with narrow margin and a flexible binding, and we hope that the author, and the many students who will use the work, will make so strong a demand upon the publishers as to compel them to speedily bring out a new edition in the more desirable form.

A NEW EDITION OF COOKE'S HAND-BOOK OF THE BRITISH FUNGI.—It is with a great deal of pleasure that we welcome the first installment of the new edition of this valuable work. The first edition which was published in 1871, has long been familiar to all students of the fungi, and while it contains much that is antiquated, it still is the only general work available. The Hymenomycetes of the new edition will appear as an appendix to *Grevillea*, so paged as to be bound separately upon its completion.

BOTANICAL NOTES.—*Grevillea* for December contains an instructive paper on alkaloids and other substances that have been extracted from Fungi, prepared by C. G. Stewart of St. Thomas's Hospital Chemical Laboratory. We hope to present extracts from this paper at an early day for readers of the NATURALIST. ——Another species of Podophyllum (the genus of our common may apple) has just been described by Dr. Hance, in the *Journal of Botany*. It was discovered in the Lo-fau-shau mountains of the province of Canton, China. It has four to five extra-axillary purple isostemonous flowers, and has been named *P. versipelle*. This makes four species of the genus now known, viz: *P. peltatum* of eastern North America; *P. emodi* of the Himalayan region; *P. pleianthum* of Formosa, and *P. versipelle* of south-eastern China. ——It is with great pleasure that we read the announcement of

the editor that the *Journal of Botany* will be continued, the support during the past year having been sufficient to leave a balance on the right side of the account.——In the October number of the *Torrey Bulletin*, Dr. Allen publishes some very interesting notes on the American species of Fortpella, with six plates of figures. A key to all the known species (12) is given, and four new species and a new variety are described. Eight species are found in North America, and these are widely enough distributed to warrant a search for them in any part of the country with a reasonable hope of success.——In the same number D. H. Campbell figures and describes some very simple prothallia of a fern *(Onoclea struthiopteris)*. A row of four or five cells terminate in an apparently single celled antheridium! They were obtained by artificial culture under glass.——Robert Ridgway, in the December *Botanical Gazette* records a number of true measurements, which confirm the belief we have held for many years that the heights of our trees as given in the books and manuals are uniformly too low; witness the following: *Quercus michauxii*, 119 feet; *Carya porcina*, 115 feet; *C. microcarpa*, 134 feet; *Catalpa speciosa*, 101½ feet; *Fraxinus americana*, 127 feet; *Sassafras officinale*, 82 feet.——After a long delay, no doubt very vexatious to the author, the botanical portion of the thirty-third and thirty-fourth Annual Reports of the New York State Museum of Natural History have appeared. The first was transmitted to the legislature in February, 1880, and the last in March, 1881. Surely the State of New York ought not to delay so inexcusably the publication of such important reports. Both contain numerous descriptions of new species, and in each are good plates giving details of structure.

ENTOMOLOGY.[1]

Flight of Insects.—Dr. Amans in his extended paper describes his examination of the structure of the thorax in Æschna, Sirex and Locusta, and discusses the views of previous authors on the subject of flight of insects. He considers that a rational theory of flight can only be formulated after various dissections and numerous experiments on the resistance of the air; the laws of the latter are as yet very incompletely known, and as to anatomy, a knowledge of one animal hardly affords a sufficient basis for a general theory. For the investigation of preliminary problems Æschna is specially well adapted, as it is probably the most swiftly flying of insects, making, as it does, twenty-eight vibrations a second.

Antennary Rods of Vanessa 10.—J. Chatin describes the cavities found on the joints which form the tip of the antennæ of

[1] This department is edited by Prof. C. V. Riley, Washington, D. C., to whom communications, books for notice, etc., should be sent.

this insect as communicating with the exterior by means of a very narrow orifice, which does not open directly to the exterior, but is more or less completely closed by cuticular ridges which approximate to and curve towards one another. Some authors, indeed, report the presence of an obturator membrane, but this is an appearance only, and seems to be due to the disposition of these parts; the rod or rods found in the pit have a peripheral zone, within which is a quantity of finely granular protoplasm; it is only in the young that one can observe the nucleus, as the rapid formation of pigment obscures the relations of this body; the bodies that have been described as nucleoli are due the granulation of the protoplasm, and the subsequent condensation of the pigment into small ovoid masses. The rod may be considered as a modified hypodermic cell of special function, and particularly characterized by the prolongations at either end; the lower of these is indicated by the nerve-branches; the upper appears to undergo a special differentiation, the exact investigation of which the author postpones for the present.—*Journal of the Royal Microscopical Society, December, 1883.*

Rudimentary Wings in Beetles.—Dr. H. Dewitz points out that the hind wings of the Coleoptera show most distinctly how an organ may gradually become aborted by disuse, and how a transformation of the whole habit of the animal may be connected with this. The membranous hind-wings of beetles, which serve for flight, lie, as is well known, concealed beneath the firm horny fore-wings, the so-called elytra. For the purpose of flight the elytra are raised, and the folded hind-wings extended, so as often to exceed the former in length. But many beetles do not fly at all. In these we find the hind-wings more or less aborted or entirely deficient. This phenomenon occurs with especial frequency among the Carabidæ, Melasomata and Curculionidæ, and also, although less frequently, among the Ptinidæ.

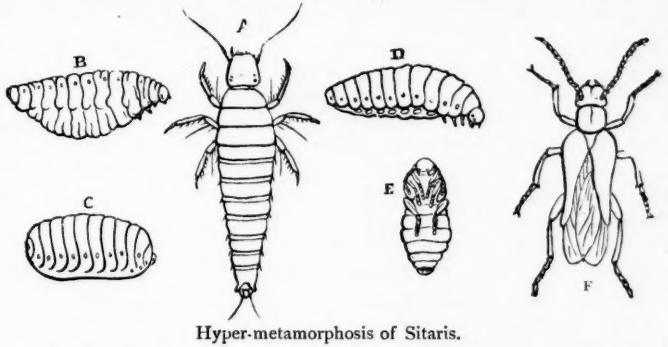
As the wings are already indicated in the larva, Dr. Dewitz was inclined to think that, in one or other of the species entirely destitute of wings, traces of these organs would occur, at least in the larval or the pupal stage. For four years his labors were in vain, and it is only quite recently that he succeeded in demonstrating the rudimentary hind-wings in the larvæ and pupæ of *Niptus hololeucus* Lam., in which both sexes are apterous, *i. e.* destitute of hind-wings. The fore-wing occurs in the half-grown larva, but the rudiment of the hind wing only shows itself much later when the animal is already on the point of terminating the larval stage.

We have in these rudiments of hind-wings an organ which is either advancing or has retrograded. That it is not an advancing organ, but one in course of disappearance, is shown most decidedly by the circumstance that this, like all retrogressive organs, does not, like those in full function, increase with the development of the individual, but, on the contrary, diminishes. We are there-

fore justified in assuming that *Niptus hololeucus* once bore well-developed hind wings, and that these gradually became aborted in consequence of disuse, until they were finally thrown back into the young stages, and some day will disappear even from these stages. In other wingless beetles this period may have already occurred.

This abortion of an organ brings after it other transformations of the body. Without the hind-wings the beetles cannot fly. It is therefore not necessary for them to be able to spread out the elytra, the latter remain permanently lying upon the back. What is the consequence? The two elytra grow together to form a firm dorsal shield, such as we find in nearly all beetles which are entirely destitute of hind-wings. At the same time the elytra become convex, and bend round at the sides, so that they embrace the abdomen. In consequence of the disappearance of the wing-muscles, the thorax becomes altered. The body acquires quite a different form; new forms are produced which we call species.

SITARIS AND ITS TRANSFORMATIONS.—Those who have read of the hypermetamorphosis of Meloë, and of Epicauta, &c., in preceding volumes of this journal, may be interested to note those of the European Meloë beetle, Sitaris, whose history was worked



Hyper-metamorphosis of Sitaris.

out by Fabre, in 1857. In the figure, *A* represents the first larva. It is hatched in the nest of bees, and when the male bees leave their holes in the spring, which they do before the females, the larvæ spring upon them, and afterwards crawl upon the females. The Sitaris larvæ devour the eggs laid by the bee, and then begin their hypermetamorphosis. The eyes disappear, and the legs and feelers become rudimentary (*B*), whilst they feed on the honey; the body and legs become short and thick, and finally a legless quiescent third stage *C;* then an active fourth one (*D*), which becomes a normal pupa *E*, the beetle being represented at *F;* all the figures being enlarged.

VARIATION IN THE ARCTIAS.—Rev. Dr. Hulst, in the Bulletin of the Brooklyn Entomological Society for October, relates how

from a single hatch of eggs of *Arctia excelsa* Neum. he reared twelve imagines in which the variation was so great as to create havoc among the species of Arctia. From his breeding Dr. Hulst now places *A. phalerata*, *pallida*, *celia*, *snowi*, *phyllira*, *figurata*, *placentia*, *decorata*, *flammea* and *excelsa* as synomyms of *A. nais* Drury, and *A. saundersii* Grote as synonymous with *A. parthenice* Kirby; *A. anna* Grote being merely a variety of the same species. Mr. Hulst is not singular in this respect. Our own rearing experience is similar and we anticipate some pretty extensive coalitions in Mr. Stretch's forthcoming monograph.

Affinities of Palæocampa.—In discussing the genealogy of the Myriopoda in a paper just issued from the Proceedings of the American Philosophical Society (Vol. xxi, p. 208) Dr. Packard concludes that Palæocampa—a caterpillar-like form described by Meek and Worthen, from the carboniferous of Illinois—is not a Myriopod as Scudder maintained, but that it may be regarded as the hairy larva of some carboniferous neuropterous insect allied to the Panorpidæ. He would therefore exclude it from any genealogical considerations in reference to the Myriopods.

The Hessian Fly.[1]—During the present summer I noticed that the Hessian fly was exceedingly destructive in some part of Perry county, Penna., especially near the west bank of the Susquehanna river, whole fields there were so badly injured that the crop was not worth reaping. It is the steady belief of the farmers in the county that the attacks of this insect are not, as is frequently supposed, most severe on the early sown wheat, on the contrary, they maintain that the earliest sown wheat, namely that put in during the first week of September, often yields a good crop, while that which is sown between the 10th and 22d is badly infested and the latest, that soon in the last week of the month, again escapes. The last part is of course natural and usual. But that the earliest wheat should thus yield well is not, I think, in accordance with the customary statements on the subject.

I am inclined to think that it may be accounted for in the following way. The early sown wheat may not escape the fly but may yield, as said above, a fair crop, because it grows strong and rank, and is thus better able to support an attack. A single "flax seed" will not materially injure a showy and healthy straw. But when, as I have seen them this season, five, six and seven are found together, the stem is so weakened that it must fall. The early sown wheat, especially if thick as it usually is in Perry county, sprouts or tillers out much more than the late wheat, and may consequently thus also make up for the destruction of some of its stalks by the fly.

It is not likely that the earliest wheat is avoided by the fly, and consequently the above explanation seems rational. It is the

[1] Abstract of a paper read before the Amer. Assoc. Adv. of Science, at Minneapolis.

spring attack that does the whole mischief to the farmer who knows nothing concerning the autumn brood.

I have, moreover, been led to believe that an enormous destruction of the "flax seed" occurs during the winter, especially in the roots, which are entirely killed by the fly. I have often dug up and examined such roots during the winter and have many times found the pupæ nearly all dead and rotten. If further examination should confirm this observation we have an efficient cause checking to a great extent the excessive multiplication of this pest.

ZOÖLOGY.

NOTES ON AMERICAN MEDUSÆ.—No group of marine animals presents a more fascinating field for the discovery of unknown facts than the Medusæ. As in the progress of science isolated observations may come to have a value greatly beyond their apparent significance, I have thought it best to publish a series of disconnected notes on these animals. Many of them have been in MS. for some time, and I have preserved them in this form with the belief that new opportunities might give me such additional observations as would enhance their value. Many notes, and some of the most important, have already become antiquated through the studies of others. The remainder are presented below as a contribution to the study of the surface fauna of the ocean, to which naturalists are at present turning their attention with renewed activity.

Dinematella cavosa Fewkes.—The youngest larva of this genus known to me is represented for the first time in the accompanying cut (Fig. 1). The most important difference between it and the adult is the very small size of the apical projection of the bell. This portion of the nectocalyx barely rises above the surface in the larva, whereas in the adult it often projects to a height equal to the diameter of the bell itself. In this projection, however, even in this young condition, the curious cavity or brood sac (*c*) can be

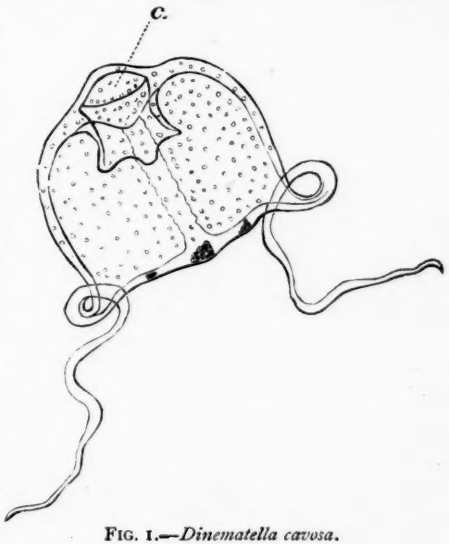


FIG. 1.—*Dinematella cavosa.*

easily seen through the bell walls. The remaining parts of the Medusa are the same as those of a larva a little older which is figured in the Bulletin of the Museum of Comparative Zoölogy, Vol. VIII, No. 8. Observations are needed to show what the function of the cavity (*c*) is in the adult.

Gemmaria gemmosa McCrady.—In the youngest larva of *Gemmaria gemmosa*, which has formerly been described, two well-developed tentacles arising from opposite ends of a diameter connecting the bell margin are represented.[1] In July, last summer, I took at Newport, R. I., a still younger Gemmaria than these, which has only one tentacle and the rudiment simply of a second diametrically opposite it, as shown in the figure.

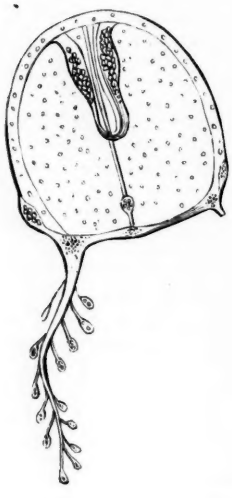


FIG. 2.—*G. gemmosa* with one tentacle.

It will thus be seen that this stage of Gemmaria, as far as the unpaired tentacle goes, resembles Hybocodon and other unitentaculated genera. It is, however, possible that this specimen was an imperfect one, and that the other tentacle had been destroyed, or possibly that its growth had been abnormally retarded.

Oceania languida A. Ag. — Every student of the group of Medusæ is familiar with the fact that abnormalities are of frequent occurrence. Numerous instances might be cited, but a few examples will suffice. We find variations in the number of tentacles, otocysts, stomachs and other structures. Among the Discophora, in Cassiopea, as elsewhere[2] described, an abnormal specimen has a double ocellus on a single otocyst, and a doubled otocyst on a single peduncle. Among the free gonophores of Hydroids variations in the course of radial tubes are very numerous, but generally consist in multiplication of parts or the addition of one or more to the typical number. It seldom happens that the number of tubes is less than the normal number four, which is a constant characteristic of many if not all the true Oceanidæ.

The accompanying figure represents an *O. languida* from Newport with a perfectly formed bell but only three radial tubes, two of which (1, 2) have normal ovaries (*o*) and one (3) ends blindly in the bell walls, half way between the center of the Medusa

[1] A. Agassiz, North American Acalephæ, p. 184. McCrady, Gymophthalmata of Charleston Harbor, pp. 48–50.

[2] Bull. Mus. Comp. Zoöl., Vol. VII, No. 7.

and the bell margin. The Oceania seemed not in the least incommoded by the loss of the fourth and the reduction in size of a third radial tube, but moved with the same ease as if both were present and well developed. There is this inexplicable relationship in the position of the two perfect tubes which remain. In normal specimens of Oceania the angle 1 P 2 between adjacent radial tubes is a right angle; here, however, it is at least 120°. The same is true of the angles 2 P 3 and 1 P 3. From which side of the base of the proboscis, in relation to those already present, ought we to suppose the missing tube, if it had existed, to arise? Shall it be in the angle 1 P 2 opposite the aborted tube 3, or in the remaining angles 1 P 3, and 2 P 3? To throw light on this question let us turn to the appendages of the bell margin, where we would naturally expect concomitant variations. Between *a* and *b* on the bell margin, corresponding to the angle *a* P *b*, there are seven otocysts and four well developed tentacles. Between sections *a* and *b* of the margin, passing through *c*, there are fourteen fully-formed otocysts and eight tentacles, or just twice as many as on the first mentioned portion of the rim. The bell margin shares with the remainder of the umbrella the trifid character indicated by the radial tubes. It seems to be, therefore, that the bell margin confirms a theory, which the radial tubes suggest, that only three sectors exist in the umbrella, while the fourth is unrepresented on the bell margin as in the body of the umbrella.

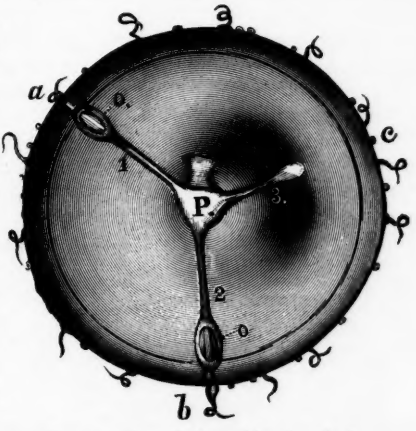


FIG. 3.—*Oceania languida*, aboral view.

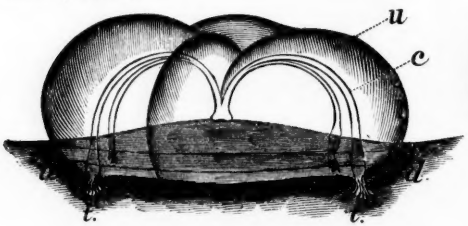
Mnestra parasita.—Among the hydroid Medusæ we find very few examples of parasitic gonophores. One of the most interesting of these is the genus Mnestra, found parasitic on the abnormal mollusk, Phyllirhoë. The affinities of this Medusa have never been satisfactorily made out, and nothing is yet known of its development.

The existence of lateral appendages to the tentacles and the absence of otocysts, leads me to place it somewhere near Zanclea and Gemmaria. The tentacles (Fig, 4 *t*) are very stunted (Fig. 6), and from their tips there arises a cluster of lateral appen-

dages, each consisting of a number of thread cells enclosed in a capsule and mounted on a small peduncle.

There are four radial tubes, and the ovaries are found along the course of these tubes instead of near the proboscis as might be expected in a gonophore destitute of marginal otocysts. Certain organs which are identified as ovaries and lie on radial tubes, are pigmented a black color.

Each of the four radial tubes has, midway on its course, a slight enlargement forming a pocket into which it is not impossible that the young are dropped, and may be carried while the larva is passing through its younger stages. There is a very small proboscis, by which the Medusa is in part fastened to the body of its host (Fig. 4).



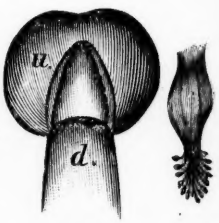


Fig. 4. Fig. 5. Fig. 6.

FIG. 4.—*Mnestra parasita* attached to the edge of the body of Phyllirhoë; *c*, radial tubes; *d*, body of Phyllirhoë ; *u*, umbrella. FIG. 5.—Section of Phyllirhoë and Mnestra body, showing how the umbrella of the latter embraces the throat of the former. FIG. 6.—Tentacle of Mnestra with side branches.

The specimens from which these observations were made are alcoholic and differ somewhat from the Mediterranean species in size and form. They have, however, the same parasitic life upon Phyllirhoë, and the variations mentioned are probably due to influence of the alcohol in which they are preserved.

Locality, Florida reefs.

Abyla pentagona Forskal.—One of the few genera of Siphonophora which has not yet been recorded from American waters is the well-known *Abyla pentagona* of the Mediterranean. A single specimen, undoubtedly of this genus and probably of the same species as the above, was found in a bottle of gelatinous animals of all kinds collected by a friend on the western coast of Florida, near Tampa bay.

Gleba hippopus Forskal.—The U. S. Fish Commission, as I have elsewhere[1] mentioned, found a single specimen of this Siphonophore off Nantucket, and a second was collected by the *Blake* in the Gulf Stream in 1880. I have to record a third specimen taken from the Gulf of Mexico, near Tampa bay, the first time, as far as I know, that the genus has been mentioned from this locality or the Gulf of Mexico.—*J. Walter Fewkes.*

[1] Bull. Mus. Comp. Zoöl., Vol. IX, No. 7, p. 275, Note. No. 8, figs. 31, 32, 33.

LIFE IN THE NAPLES AQUARIA.—H. Eisig placed in a basin of water an Octopus, a Gobius and a Pagurus, with an Actinian on its shell; the Octopus attacked the crab, which immediately withdrew into its shell, while the attacker instantly retreated, for the stinging organs of the Actinia had been too much for it. The same thing happened with the goby. A Pagurus without a shell was afterwards placed near the Octopus, and the latter examined it very carefully before it dared to seize it. At the same time it is to be observed that the Actinian gets much assistance from its commensal, thanks to the locomotive and olfactory powers of the latter.

Observations on thermal conditions showed that many fishes and other marine forms were but little affected by alterations in temperature; while a study of the modes of nesting of marine forms shows that much depends on what region of the sea the subjects naturally inhabit, and considerable differences are to be observed between pelagic and more deeply dwelling fishes and cephalopods.—*Journ. Roy. Microscopical Society, Aug., 1883.*

NEW HUMAN CESTODE—LIGULA MANSONI.—Dr. S. S. Cobbold describes a Cestode, twelve of which were found in a Chinese, lying in the subperitoneal fascia, about the iliac fossæ, and behind the kidneys, a single one being found lying free in the right pleural cavity. They were from 12 in. to 14 in. long, 1-8th in. broad and 1-64th in. thick. The Cestode comes nearer to *Ligula simplicissima*, frequently found in the abdominal cavity of fresh-water fishes, than to any other species, and without asserting positively that it may not be a variety of that form, the author thinks, from the unique character of its habitat, associated with certain differences of form, that it may properly be regarded as the immature representative of a totally distinct species.—*Journ. R. Micr. Soc.*

HYDRO-MEDUSA WITHOUT DIGESTIVE ORGANS.—Dr. Lendenfeld describes a new sub-family of hydroids, Eucopellinæ, in which the medusa has no digestive organs, and lives only a short time after its escape from the gonophore. Only one species, *Eucopella campanularia*, is known, and this is found in Australia. The larva is a campanularian whose hydranths are carried upon almost unbranched stems, which spring from a creeping root. The medusa has a veil, well-developed marginal sense-organs, radial and circular chymiferous tubes, and large reproductive organs, but it has no mouth, stomach, or tentacles. It discharges its reproductive elements within twenty-four hours after its liberation, and it lives only about thirty-six hours.—*Journ. Roy. Microscopical Society, Aug., 1883.*

BLUE COLORING MATTER OF RHIZOSTOMA.—R. Blanchard has a note on his own investigations into the blue coloring matter of *Rhizostoma cuvieri*, in which he points out the differences between his results and those lately obtained by Kleinenberg on the same

body; one which the latter author distinguishes as cyanein. The French observer finds that the tissues give up the color after death, and that the blue color of the aqueous solution disappears when heat of from 40° to 45° is applied, and gives place to a well-marked rosy hue, which again disappears on cooling. Spectroscopic examination reveals the presence of three absorption-bands, one in the red, one in the yellow, and one in the green region; the second of these corresponds almost exactly in position to the sodium-band. If the aqueous solution is treated with ammonia the blue color is immediately precipitated under the form of small blue flakes which may be collected on the filter-paper and analyzed. The author hopes that further investigations will reveal the cause of the differences which obtain between his results and those of Kleinenberg.—*Journ. Roy. Microscopical Society, Aug., 1883.*

An Oyster on a Crab.—A fisherman has sent me a small crab with an oyster somewhat larger than itself ensconsed on the right side of its carapace. The crab is *Cancer irroratus* Say, and is a young female which has but just attained puberty. The shield is two inches across, and one-and-three-fourths inches from front to back. The caudal flap is distended with eggs. The oyster is two-and-half inches in length, and two inches wide, and is firmly attached to the right extremity of the carapace. It is a wonder how the prospective little mother could manage her charge so far, and at the same time carry such a lobsided encumbrance; the crab is hardly more than one-fourth fully grown. The oyster, it is pretty certain, is about four months old.—*S. Lockwood.*

Moulting of Limulus.—I was much interested in Mr. B. F. Koon's article in the December Naturalist, on Sexual Characters of Limulus. But it caused surprise to see a discussion of points which I thought were settled in my article on the Horse-Foot Crab, in Am. Naturalist, Vol. iv, 1871, p. 257. The points there made are that the male Limulus does not assume the large claws or claspers until puberty, which I expressed the belief did not come until the age of three or four years. Hence the exuviæ of the young crabs show no difference of the forward claws. I also observed the probable numerical equality of the sexes. As to the exuviation of large crabs, I gave instances and measurement of increase. Where these crabs are common the shedding of the adult is not a rare sight.

As to finding undoubted exuviæ of the adult males brought up by the sea, it is uncommon to find such of either sex. The young have very light shells, and their exuviæ are easily brought shoreward by the wash, and often make vast wind-rows. Whereas the adult exuviæ are heavy, and are seldom found brought up. I think, too, that the young crabs prefer shoaler waters than

do the adults. I have shown that at considerable depths, even in winter, the large adult has been known to shed. Had Mr. Koon consulted the article referred to he could not have written, "We are led to believe that large Limuli rarely, possibly never, shed, because among all those examined, there were no large exuviæ." On seeing the act of exuviation by a large Limulus, an officer of the United States Army, at the fort at Sandy Hook, N. J., exclaimed: "The animal is spewing itself out at its mouth!"—*S. Lockwood.*

SOGRAFF'S EMBRYOLOGY OF THE CHILOPOD MYRIOPODS.—We have received from the author an elaborate memoir, unfortunately in the Russian language, and with no complete abstract in French or German, on the embryology of two species of Geophilus (*G. ferrugineus* and *proximus*). It is a large quarto brochure of 77 pages, dated Moscow, 1883, with the illustrations, printed sometimes in three colors, inserted in the text; as the drawings of the sections and complete embryo are on a large scale, one can form some idea of the nature and high value of the author's work. The bibliographical references are full and satisfactory. Beginning with careful comparative descriptions of the two species of Geophilus, whose development is described, the internal reproductive organs are figured and elaborately described. In a partial abstract which appeared in the *Zoologischer Anzeiger* for Nov. 6, 1882, Sograff states that the best material for his researches were the above-named species of Geophilus. The Lithobii present much more difficult material for study, as their eggs are scattered in the earth or in the humus of decaying vegetation, and are like small particles of sand, from which they often can with difficulty be distinguished; besides this the egg-membranes are unusually thick, rendering them difficult to study. The eggs of the Geophili lie under the bark of trees (*G. proximus*) or in sandy soil (*G. ferrugineus*) in small bunches, eighteen to thirty-five in number, and are protected and watched by the female. It is very difficult to keep the eggs alive in confinement, since they are attacked by fungi. It is also almost impossible to study the eggs in all stages of one and the same brood, so that one has to make almost daily excursions for material for study.

The eggs of *Geophilus ferrugineus* are ruby-red and almost perfectly transparent, they are probably those figured by Metschnikoff in his researches. While in the oviduct the egg is enveloped in a transparent coat, which appears to consist of the united chorion and yolk membrane, for these structures can be distinguished in young ovarian eggs. At this stage the egg is filled with yolk, hiding the germinal vesicles and yolk nucleus; but on one occasion a nucleated mass of protoplasm—the nucleus being spindle-shaped, and exhibiting division of its chromatin into two groups of rods—was found in the center, probably derived from the germinal vesicle. The nucleus and protoplasm divide into a

considerable number of portions; the central cleavage-masses are round or polygonal, the peripheral ones stellate. Yolk cleavage now takes place, the yolk breaking up into pyramidal masses, as in the Decapoda, these masses carrying portions of protoplasm upon their apices; the segmentation is not dichotomous; the number of pyramids was always the same, and the only difference between the young and the perfect pyramid consists in an indefiniteness of outline in the apex of the former. The simultaneous origin of the masses is not an impossible circumstance, and is explained by the action of the central protoplasm in drawing into itself the superincumbent yelk. The protoplasm-masses of the yelk now sink into the pyramids which form the primary endoderm, and the central protoplasm-masses come to the surface of the ovum and form the primary ectoderm. In the Chilognatha, judging from Polydesmus, the method of formation of the blastoderm more resembles that of the Crustacean and Arachnida; the yelk cleavage appears to have been correctly described by Metschnikoff. The blastoderm of Geophilus consists at first of large, pale, very thin cells, dividing very rapidly so as to form, in the course of twenty-four hours, a number of very small cells, which are, however, smaller on one side of the ovum than on the other; on this side the primitive streak appears, beginning at its anterior end, which develops the first segments and appendages before the hinder portion is clearly defined. Before the appearance of the primitive streak the mesoderm is divided off from the small-celled ectoderm, and at the same time nuclei, invested by means of protoplasm, emerge from the yelk-pyramids and apply themselves to the mesoderm; these masses seem to be derived from the nucleus of the ovum, and to have hitherto remained at the center. The mesoderm, like the primitive streak, develops first in front. The conversion of the yolk-pyramids into endoderm, *i. e.*, into the epithelium of the mid-gut, only takes place when the embryo is fully formed; it commences during that stage which Professor Metschnikoff did not observe, and at the same time as the beginning of flexion of the embryo.

The two preceding paragraphs have been taken from the translation in the Journal of the Royal Microscopical Society of the author's abstract (published in the *Zool. Anzieger*, v. 582). The later stages are described in detail, with sections, both transverse and longitudinal, and views of the complete embryo at different stages; with some sketches of the later embryo of Lithobius. The structure of the nervous system is described and figured, including the brain of Scolopendra, in a comparative way. A translation of the entire memoir would be most desirable.

New Cave Arachnids.—The following cave Chernetidæ, Phalangidæ and Nemastomatidæ are interesting additions to our cave-fauna.

Obisium caricola, n. sp.—This is an aberrant species, but ap-

parently belongs to this genus. The cephalothorax is much longer than broad, widest just before the middle, narrowing in front and behind, and deeply cleft between the cheliceræ, an unusual feature in the genus. There are no eyes. The cheliceræ are rather smaller than usual and separate at base; the head is shorter and the fingers longer than usual. The pedipalps are as long as the body without the cheliceræ, and are rather thick. The abdomen is narrow and rather long, with the segments well marked. Length of body including the cheliceræ $2^{mm.}$ One specimen, collected by us in the Newmarket cave, Va.

FIG. 1.—New Cave Obisium.

Chthonius cæcus, n. sp.—Body unusually short and broad, and the limbs short and thick. Eyeless. Cheliceræ very stout and thick. Pedipalps unusually short; the 2d joint short and twice as thick as in *C. packardii* Hagen; 3d joint short, thick, conical; manus very short and thick, really but little longer than the 3d joint; the movable finger nearly twice as long as the manus; it is stout and very straight, and serrulate on the inner edge. Legs short and thick. Length of body with the cheliceræ, $1.5^{mm.}$ Two specimens collected by us at Weyer's cave, Va.

Phlegmacera cavicolens, gen. et sp. nov.—*Gen. chars.*—In this genus of Phalangidæ the body is not spiny, is slightly compressed, much less flattened than usual, no broader than high, and the tergal as well as ventral surface is unusually convex and rounded. The cephalic plate bearing the eyes is about half as long as broad. The abdomen forms two-thirds the length of the body, with nine segments seen from above. Cheliceræ 3-jointed. Pedipalps 6-jointed, considerably longer than the body. It has no very close affinities to any of the European genera.

Sp. Chars.—Eyes large, prominent, scarcely situated on an eminence, black and well developed. A series of large, short but broad dorsal, transverse, blackish spots, and broad dusky lateral diffuse band. Cheliceræ with manus rather thick, the fingers very unequal; the movable fingers about two-thirds as long as the manus with a series of about 24 separate stiff, straight, setæ. Pedipalps densely setose, from ¼–⅓ longer than body, 5th joint longer than any of the other joints, and much swollen, oval; 6th no longer than 5th is wide. Fourth pair of legs with joint 5 divided at the end into nine minute joints, and the last tarsal joint (joint 6) subdivided into twelve joints. Length of body, $4^{mm.}$; thickness, $2.5^{mm.}$; width, $2^{mm.}$ Bat cave, Carter Co., Ky. Two specimens.

Nemastoma inops, n. sp.—Eyes wanting, with traces of a retina,

however. Chelicerae slender, rather long, inner edge of each finger with short, stiff setæ. Pedipalps of moderate length; 2d joint not much longer than the basal, being slightly longer than thick; 3d joint three times as long as the 2d; 3d and 4th of the same length, but the 4th a little thicker; 5th slightly longer and thicker than the 4th, with numerous stout setæ of nearly even length; 6th (terminal) two-thirds as long as the 5th and nearly as long in proportion as the terminal joint in *N. troglodytes* Pack.; it is very setose, and the tip is rounded.

Legs of the 2d pair 3^{mm} in length, hairy, last tarsal joint undivided; 4th pair 4^{mm} in length; the last tarsal joint with nine subjoints, and the claws smaller than in the 2d pair.

Length of the body, including the chelicerae, $1^{mm.}$ Bat cave, Carter Co., Ky. Two immature specimens, but the species is very characteristic, and this is the first occurrence of the genus east of the Great Basin.

Ventral Repugnatorial Organ in Centipedes (Geophilus).—The gland which emits a red liquid by certain disks in the median ventral line of *G. gabriellis*, has been studied by M. Passerini. The disks are epidermal structures about 0.2^{mm} in diameter in adults, and are placed in slight depressions of the integument, one on each foot-bearing segment; their center is occupied by about a hundred glistening bodies, which are the truncate ends of a corresponding set of conical mouth-pieces belonging to long ducts, each of which leads from a long pyriform gland. This gland is called unicellular by Passerini; its basal membrane, which is very thin, contains a number of smooth and striated fibers which ramify, anastomose, and form a reticulum, and are connected similarly with those of the neighboring glands, and extend over the ducts. The larger fibers, some of which measure 0.012^{mm} in diameter, start from common centers. The fibers very often exhibit a succession of slight inflations, and are evidently contractile and intended to compress the gland and expel the contents. The system of glands belonging to one segment is invested by a delicate membrane containing weak fibers and surrounded by adipose cells, and it is innervated by nerve-branches derived from the anterior nerve of the pair which is given off on each side by the ganglion of the segment; the tracheæ belong to a branch which comes direct from the main trunk.

The liquid contained in the gland coagulates promptly in the air, has an acid reaction and taste, and irritates the tongue, is soluble in water and alcohol, and becomes whitish under the action of caustic potash; the coagulum shows, under the microscope, an amorphous mass containing elongated crystals, which generally form rosettes about 0.14^{mm} in maximum diameter; analysis shows its composition to be analogous to that of silk. The only direct

evidence as to the function which the author was able to obtain, was that when the back is mechanically irritated the animal turns up its ventral surface and the disks become covered with the fluid, the object of which seems to be retaliation.—*Journ. R. Micr. Soc.*

ALBRECHT ON THE MORPHOLOGICAL VALUE OF THE MANDIBULAR ARTICULATION.—In this pamphlet M. P. Albrecht combats the general idea that the ear-bones are homologous with different parts of the first, or first and second visceral arches—parts which are distinct bones in the lower gnathostomes. His argument is as follows: In all non-mammalian gnathostomes the articulation of the mandible is between the articular element and the quadrate, and good evidence is needed to the contrary before we are bound to believe it otherwise in mammals. He maintains that the squamosal is a compound bone, formed of the true squamosal and the quadrate, and that the mandibular articulation is with the latter element, just as in other gnathostomes. This belief is founded upon the state of things existing on the left side of a new-born infant's skull in the writer's possession. In this skull the temporal of the right side is normal, but on the left side the zygomatic part is isolated from the true squamosal, which is united with the ali-sphenoid. Cases of a sutural division of the squamosal into an upper and lower portion are cited. If then, the zygomatic part of the squamosal is really the quadrate, and the mandibular articulation is the same in all gnathostomes, another explanation of the ear bones must be sought for. After enumerating and tabulating the various conflicting theories of Reichert, Günther, Gegenbaur, Huxley, W. K. Parker, Salensky, Kölliker, Wiedersheim and Fraser, upon this point, M. Albrecht declares that for him the bones of the ear are nothing more or less than dismemberments of the columella of the Amphibia. In the Urodela this columella is a cartilaginous rod connecting the tympanum with the fenestra ovale; in the Anura it consists of four cartilaginous portions which perform the same office, and are without question homologous with the single cartilage of the urodela; and in the Mammalia the four tiny ear bones are identical in position and function, and homologous in origin with, the four cartilages of the anuran columella. The columella in all these cases is without question homologous with the suspensorium of the mandible of gnathostomes that have no columella. The extra-mandibular part of Meckel's cartilage, in M. Albrecht's opinion, belongs to the malleus, and is homologous with the suspensory-articular ligament of selachians, with the symplectic-articular ligament of teleosts, and with the columello-articular ligament of the Batrachia and Sauropsida. Thus the arrangements are the same throughout, and the suspensorium of the mandible exists in fishes, Batrachia, Sauropsida and Mammals.

CHARACTERS OF HUMAN FEMORA.—Dr. E. Houzé, in the bulletin of the Anthropological Society of Brussels, gives the result of an examination into the third trochanter as it occasionally appears in a rudimental condition in man. He finds it to be more common in the higher than the lower races, as it is the point of insertion of the gluteus maximus muscle, which is in man intimately connected with the maintenance of the erect position. Thus it is very rare in the Anthropoid apes which are "platypyges;" it is rare in the negroes which he terms "micropyges," while it is very common in Europeans, who are "megapyges," or have the gluteus muscles best developed. It is rather more common in women than in men. The hypotrochanteric fossa is situated below the third trochanter. It is rare in men of the present period, but is constantly present in the femora of the men of the reindeer epoch in Belgium. It is found in men from Grevelle and Cro-Magnon in France.

ZOOLOGICAL NOTES.—*General.*—Professor E. H. Giglioli, in a written note appended to an inaugural discourse delivered by him at the opening of the new hall, for the Central Collection of Italian Vertebrates in the Museum at Florence, states that there are now in that collection more than 22,000 specimens, including examples of all the mammals (108 species), reptiles (41 species), and batrachia (21 species) found in Italy. The birds are represented by 22,000 examples and 415 species, and the fishes by more than 14,000 specimens and 554 species, yet these classes are not quite complete. The same naturalist writes of the recent discoveries by the Italian vessel *Washington* and the French *Travailleur* as the "discovery of an abyssal fauna in the Mediterranean," since Dr. Carpenter had confidently asserted the scarcity of life in the depths of that sea. Among the results obtained by the *Washington* were Willemœsia, Dorocidaris, Brisinga, Argyropelecus, Gonostoma, Hyalonema, *Chlorophthalmus agassizi*, a singular fish with large emerald eyes, Gadiculus, *Macrurus scelerorhynchus*, and many other interesting forms. Species which are known to inhabit depths eight times greater were found at depths of 400 to 500 meters.

Reptiles.—Dr. J. G. Fischer has recently described *Cnemidophorus affinis*, from Hayti; *Euprepes elegans* from Sierra Leone; *Sphenocalamus lineolatus*, a new genus and species of calamarid from Mazatlan, *Homolocranion lineatum* from Venezuela; *Leptophis frenatus* from Sierra Leone; *Bothriechis trianguligerus* from Guatemala; and *Helicops marginatus*.

Fishes.—The report of Messrs. Goode and Bean upon the fishes dredged during the summer of 1880 on the east coast of the United States enumerates fifty-two species, of which five were Pleuronectidæ, including two new species; six Macruridæ with three new species, eight Gadidæ, with one new species, three Cotti-

dæ, with one new species, four Lycodidæ, two of which are new; and three Sternoptychidæ, one of which is new. Most other families are represented by one species only, but include a new species of Alepocephalus, Bathysaurus, Halosaurus, and Mettastoma, as well as *Poromitra capito*, a Berycoid fish. Altogether, the list of United States fishes receives seventeen additions.——W. K. Parker has published a memoir with twelve colored plates upon the structure and development of the skull in the sturgeons *A. ruthenus* and *A. sturio*. His conclusions are that we have in the sturgeon a form practically intermediate between the Selachians and the Holostei. The first stages of the cranium are, to use his own words, "confusingly simple," and he believes that the vertebral segmentation of the skull is *a comparatively late and secondary specialization*. The same anatomist also, in the Philosophical Transactions of the Royal Society, gives an exhaustive account, with nine plates of sections, etc., of the development of the skull in *Lepidosteus osseus*. In comparing the skull with those of Polypterus and Amia, he says "Amia is a true Ganoid, and has several unmistakable diagnostics even in its skull, but it comes very near to the Physostomous Teleosteans.——In the Proceedings of the United States National Museum, Messrs. Jordan and Gilbert give a review of the American Carangidæ, with the synonymy and geographical distribution of each species. The genera recognized in the family are only six: Megalaspis, Decapterus, Trachurus, Caranx, Silene, and Chloroscombrus. The artificiality of generic distinctions generally is to some extent acknowledged in the following words: "This division is not wholly natural, inasmuch as the differences between the extremes among the species of Caranx are greater than those separating some of these species from related genera, while, on the other hand, the characters separating Trachurus and Silene from Caranx are technical only." Decapterus has five American species; Trachurus is credited with two, the *Caranx symmetricus* of Ayres being accorded specific rank with the name of *picturatus;* Caranx, of which Blepharis, Vomer and seven others are made sub-genera, has nineteen species, Silene two, and Chloroscombrus two, making thirty species in all. In the same Proceedings, Dr. T. H. Bean records the first occurrence of *Pseudotriacis microdon* Capello on the shores of the United States. It is a rare species, and was before known from Portugal only. The example referred to came ashore at the Amagansett life-saving station on Long Island. Professor Jordan describes a new Muræna from the Galapagos islands. He separates under the name of Sidera those species of Muræna, which have the posterior nostrils without tubes, and the teeth all sharp, and gives to the new species the name of *S. ehlevastes*. Messrs. Jordan and Gilbert also described a new species of Rhinobatus *(R. glaucostigma)* from Mazatlan. In the same Proceedings Miss Rosa Smith describes the life colors of *Cremnobates integripinnis*, and notices

the occurrence of *Gasterosteus williamsoni* in an artesian well at San Bernardino, California.——Messrs. Evermann and Meek (Proceedings Academy Natural Sciences, Philadelphia, 1883), define sixteen species of Gerres, and review the species found in American waters. *G. homonymus* is considered identical with *G. gula* C. and V. and *G. harengulus* with *Eucinostomus pseudogula* of Poey and *Diapterus gracilis* of Gill.

Birds.—Dr. R.W.Shufeldt publishes in the Journal of Physiology and Anatomy (XVIII, 86), observations on the osteology of *Podasocys montanus*, illustrated by a plate. In 1859 the skins of but two of these birds were in the Smithsonian collections. Upon its native plains, and in the open parks of the Rocky mountains, it has all the habits and action of a true plover, lacking only in the noisy traits of Vanellas and Ægialites.——The Bulletin of the Nuttall Ornithological Club for October, 1883, contains a notice by Dr. C. H. Merriam, of the yellow-green vireo, which has not before occurred north of Fort Brown, Texas. It was found dead in the Province of Quebec, Canada, and was probably a storm waif. Dr. Merriam also states that the harlequin duck, a common summer resident in Newfoundland, nests in hollow trees. His authority is James P. Honley, of the Newfoundland Geological Survey, who writes: "It is quite true the birds nest in hollow stumps of trees, usually on islets in the lakes or tarns of the interior. They usually frequent the larger lakes and rivers far from the seacoast, but are found scattered all over the country."——W. Brewster notices an apparently new gull from Northeastern America, which Kumlien regarded as *Larus glaucescens*, but which Brewster renames *Larus kumlieni*.——The nest and young of the pigmy owl at Fort Klamath, California, are described by C. F. Bendire.

Mammals.—Dr. J. B. Holder, of the American Museum of Natural History, New York, has added further to our knowledge of the right whale of the north temperate Atlantic (*Balæna cisartica* Cope) by the publication of figures and descriptions of the exterior characters and osteology of three or four examples, including both sexes. The head is always relatively shorter than in *B. mysticetus*, but a female from the New Jersey coast has a longer head than the males. Dr. Manigault, in a letter to Dr. Holder respecting an example taken at Charleston, South Carolina, states that a fishery for this whale is carried on to a limited extent off the coast of South Carolina and Georgia, and that it attains a length of sixty feet.

PHYSIOLOGY.[1]

DIGESTION WITHOUT A STOMACH.—In the *Archiv f. Anatomie u. Physiologie*, 1883, M. Ogata describes some remarkable experiments upon the digestive powers of animals in which the influence

[1] This department is edited by Professor HENRY SEWALL, of Ann Arbor, Michigan.

of the stomach was nearly or completely excluded. A dog was submitted to an operation in which the whole of the stomach was removed except a small part of the wall near the cardiac entrance of the organ. The free edges of the alimentary tube were sewed together, the animal completely recovered from the operation and was killed six years after for the purpose of post mortem observation. During that period the dog remained in perfect health, gained in weight and readily digested the most various food matters. The fœces were quite normal in character. Ogata studied the subject farther in various ways. In dogs possessing a gastric fistula food matters of different kinds were introduced, by means of a tube passed through the opening in the stomach wall, directly into the duodenum, the gastric juice being prevented from passing the pylorus by means of an appropriate plug. When mixed tissues, such as pieces of liver, lung or intestinal mucous membrane were thus introduced into the duodenum, it was found that the cellular or albumen-containing elements were most readily dissolved, while the collaginous and reticular tissues were comparatively unaffected. Elastic tissue was also dissolved, but more slowly than the first-named. With vegetable substances it was found that the cell contents were dissolved while the cell-walls, though apparently offering no great resistance to the diffusion of the intestinal juices through them, remained undigested. A number of dogs were fed in the way described with meat or eggs and killed in a painless manner at different times after giving the meal. It was found that the food in each case had provoked active secretion of the alkaline fluids of the pancreas and intestine and that a large amount of material was digested and absorbed within two hours after feeding. The conclusion arrived at is that albuminous bodies and cooked connective tissue are digested as thoroughly and speedily by juices poured into the intestine alone as by the secretions of the stomach and intestine together. In these digestions there seemed to be a very limited flow of bile. Comparative experiments showed that albuminous substances were digested much more completely and speedily in the intestine alone than in the stomach alone, and such food matters were digested more rapidly when brought directly into the intestine than when taken in the natural manner by the mouth.

Measurements of the Depth of Sleep.—Two of Vierordt's pupils have made the depth of sleep the subject of an investigation. They worked upon the principle that the depth of sleep is proportional to the strength of the sensory stimulus necessary to awaken the sleeper, that is, to call forth some decisive sign of awakened consciousness. As a sensory stimulus they made use of the auditory sensation produced by dropping a lead ball from a given height. The strength of the stimulus was reckoned, in accordance with some recent investigations of Vierordt, as increasing, not directly as the height, but as the 0.59 power of the

height. For a perfectly healthy man, the curve which they give shows that for the first hour the slumber is very light; after one hour and and fifteen minutes, the depth of sleep increases rapidly, and reaches its maximum point at one hour and forty-five minutes; the curve then falls quickly to about two hours and fifteen minutes, and afterwards more gradually. At about four hours and thirty minutes, there is a second small rise which reaches its maximum at five hours and thirty minutes, after which the curve again gradually approaches the base line until the time of awakening.

Experiments made upon persons not perfectly healthy, or after having made some exertion, gave curves of a different form.—*Science.*

EXPERIMENTS UPON THE HEART OF THE DOG WITH REFERENCE TO THE MAXIMUM VOLUME OF BLOOD SENT OUT BY THE LEFT VENTRICLE IN A SINGLE BEAT, AND THE INFLUENCE OF VARIATIONS IN VENOUS PRESSURE, ARTERIAL PRESSURE, AND PULSE-RATE UPON THE WORK DONE BY THE HEART. By W. H. Howell and F. Donaldson, Jr.[1]—Owing to the indirectness of the methods hitherto used for estimating the quantity of blood pumped out from the left ventricle at each systole, this important factor in all calculations of the work done by the heart has never been satisfactorily determined. Volkmann, and afterwards Vierordt, from calculations based upon the mean velocity of the stream of blood in the unbranched aorta, obtained the fraction $\frac{1}{400}$ as representing the ratio between the weight of blood thrown out at each systole and the body-weight. Fick, from data obtained by placing the arm in a plethymograph, arrived at a much smaller fraction, $\frac{1}{1000}$. In our investigation we have made use of the dog's heart, completely isolated from all other organs of the body, with the exception of the lungs, after the method devised by Professor Martin. By this method it is possible to estimate directly the quantity of blood ejected from the left ventricle at each systole.

With regard to the maximum quantity of blood which can be thrown out from the left ventricle at a single systole, the general result of the experiments may be stated as follows: With a mean pulse-rate of 180 per minute, the mean rate of the maximum weight of blood pumped out from the left ventricle at each systole to the body weight is $\frac{1}{855}$ or .0017. In one experiment in which the pulse-rate was 126 per minute, about the normal rate, the ratio obtained was $\frac{1}{700}$ or .0014. In applying these results to the normal dog, we believe that the average quantity of blood pumped out from the left ventricle at each systole in the living dog, is approximated most closely in the experiments given by the maximum outflow obtained from the isolated heart.

Variations of arterial pressure, from 58 to 147 millims. of mer-

[1] Abstract reprinted from the Proceedings of the Royal Society of London, No. 226, 1883.

cury, were found to have no direct effect whatever upon the quantity of blood sent out from the left ventricle at each systole. Since the pulse rate is not altered, the work done by the left ventricle varies directly as the arterial pressure against which it works, within the limits named. For how much wider limits than those given this may hold true was not determined. There is every reason to believe that under normal conditions the force of the systole is more than sufficient to completely empty the ventricular cavity, and since, with arterial pressures from 58 to 147 millims., the quantity of blood ejected at each systole remains constant, it seems probable that within these limits, at least, the force of the ventricular contraction is not influenced by variations in arterial pressure, but remains maximal throughout.

Variations of venous pressure on the right side of the heart influence in a marked manner the outflow from the left ventricle. As the general result of the experiments it was found that the outflow from the left ventricle, and consequently the work done by it, increases with the venous pressure, but not proportionally, up to the point of maximum work.

Variations in the rate of beat of the heart were obtained by heating or cooling the blood supplied to it. The general result may be stated as follows: A diminution of pulse-rate, brought about by lowering the temperature of the blood flowing into the heart, causes an increase in the quantity of blood thrown out from the ventricle at each systole, and consequently an increase in the work done at each systole, and *vice versa*. The changes in the outflow from the ventricle at each systole are not, however, inversely proportional to the changes in the pulse-rate. The total outflow, and, therefore, the total work done during any given period of time, decreases with a diminished pulse-rate, and increases with an increased pulse-rate.—*Johns Hopkins Univ. Circ., November, 1883.*

PSYCHOLOGY.

INTELLIGENCE IN A POINTER.—Don was a pointer dog, of large experience, that I shot with over forty years ago. At that time the pinnated grouse were abundant in our wild prairies. The birds were more frequently found in particular localities in different parts of the day. They affected the low grounds or swales, where the grass was long, in the heat of the day, and in the morning and evening they resorted to the high, rolling prairie. In a cool, cloudy day they were likely to remain on the high grounds. Don had learned this as well as his master, and when taken into the field it was interesting to observe the dog, when on the prairie, deliberately surveying the ground and then start out and range over the same ground his master would have selected.

This was the result of education and observation, and was not peculiar to Don. I have known many old bird dogs do the same.

But there was one thing which Don had not been taught in training, but which he had adopted of his own notion, as the result of his own reasoning or reflective powers.

When a young bird gets separated from its companions, or it may be is the last of a covey which has escaped the fowling-piece, it is apt to wander a good deal, and the dog may follow its trail for a considerable distance. When pressed it will seek short cover if convenient, and there the trail is freqently lost. In such cases I have frequently seen Don hunt about rapidly and irregularly for a short time, and if still unsuccessful he would return to the last point where he could detect the scent, and then commence to hunt in a circle, enlarging the circle by perhaps two feet in the radius, and these were made with wonderful regularity till he had covered the ground for many rods around, if the want of success required it, but he generally found the bird within ten or twelve feet of the starting-point. I once knew him to go over the ground a second time in the same way before he was successful.

Invariably the bird was found to have conccaled itself in a deep narrow depression in the prairie.

I repeat that the dog had not been taught, but had adopted it voluntarily, or, it was his own invention.

I never knew any other dog to do this, although a book could be filled with accounts of smart things which bird dogs have been known to do.—*J. D. Caton.*

A Labor-Saving Fish-Hawk.—Audubon, in his Birds of America, remarks (Vol. I, p. 65, octavo edition), that "A most erroneous idea prevails among our fishermen and the farmers along our coasts, that the fish-hawk's nest is the best '*scare crow*' they can have in the vicinity of their houses or grounds, as these good people affirm no hawk will attempt to commit depredations on their poultry so long as the fish-hawk remains in the country." Whether this is true or not is of little consequence. We all know, however, that they generally build by choice in human vicinity, and never conceal their nests from our view; differing in this respect from most other birds, including some that are domesticated. From Sandy Hook to Cape May is the favorite summer residence of the fish-hawks (*Pandion haliaetus*), there many of their nests may be seen in a single view along the sea coast.

About fifteen miles north of Cape May, N. J., Silver island,

better known as the seven mile beach, appears to be a favorite spot in the breeding season; there, the writer of this article has photographed seven of their nests. All are built on the tops of trees of various altitudes, with one exception, one being built on the roots. The tree is, however, turned upside down, as represented in our sketch as a picturesque object. The founders of that family residence selected the roots of the tree uplifted and forming a basin-like solid foundation, conveniently shaped to save labor in collecting sticks, of which the superstructure is formed, slight additions being sufficient for the cradle of ten generations of young hawks which I have known.

That lone and venerable cedar tree stands in a salt meadow, half a mile from the sea, with its roots high up in the air, while its branches are buried, and hold it to the earth, the effect of some terrible storm of wind or sea (perhaps both), no one knows when as far as I could learn. On the roots of this tree the fish-hawks have annually repaired the nest and raised their families. Now they have abandoned it.

It may not be out of place to remark here that the fish-hawks do not always select a dead tree on which to build, as is generally supposed, almost all their nests being seen on dead trees, but it is a fact that the trees selected almost certainly die, or the upper branches do, in a few years after being so occupied.—*T. R. Peale.*

THE PERMANENCE OF THE DOMESTIC INSTINCT IN THE CAT.[1]—That the common cat would return to its primitive feral state, if a company of them of both sexes were turned loose in a region where they could have no access to mankind, is probable, and perhaps certain. But that the domestic instinct has now become an integral characteristic of the species, is a matter that will hardly be questioned by any one. Still opportunities to test the real permanence of this instinct are not often presented. I had the good fortune, however, to meet with an interesting opportunity of this kind, during the prosecution of my field work for the U. S. Geological Survey, in the summer of 1883.

In the prosecution of that work I made the journey, together with my party of three other persons, in an open row-boat, from Fort Benton, Montana, to Bismarck, Dakota, a distance of more than 1000 miles; nearly 600 miles of that journey being through a region which has so few inhabitants that no post-offices were established there. The only white people in the region were a few buffalo hunters, and the woodman who supplied the few passing steamers with fuel, and even these persons were rarely seen upon our journey.

Upon making our camp one night, about 100 miles above Fort Peck, a good sized black-and-white male cat came to the boat, and, although shy at first, soon manifested gratification at meet-

[1]Read before the Biological Society of Washington, Nov. 16, 1883.

ing us. I at first supposed that he belonged to some settler, but upon examining the neighborhood, no trace of the recent presence there of white men could be detected. When we started upon our journey in the morning, we left the cat on shore, but he followed along the bank, mewing piteously to be taken on board. The boat was headed for the shore, and as soon as it touched the bank the cat jumped on board, evincing delight at being in our company. For the next 100 miles he was our companion, and we became very much attached to him. He was extremely neat and never soiled the boat in any respect while we had him. At times he would ask plainly, by such signs as he could command, to be set on shore; and then he would hurry back again for fear of being left. He was gratified with our attentions to him, and purred approvingly when we caressed him.

We would have gladly taken him to Washington with us, but as that was impracticable we decided to leave him at the first place which should seem to offer him a good home. Upon reaching Fort Peck, which is now only an Indian trading post, we found only one white man there, who was in charge of the store. To him we told the story of our cat and begged him to give the wanderer a home. He consented, and upon going to the boat he at once declared our cat to be one which he, in company with a party of buffalo hunters, had, the year before, taken to the place where we had found him. He said the cat was absent, probably on a hunt, when they broke their camp, and so Jerry, for that was the name we had given him, was left there, and had spent the year alone in the wilderness, hunting his own living.

Of course I cannot cannot say that Jerry had not associated with mankind in all that time, but the circumstances favor such a conclusion. If he had, after his abandonment, taken up with any settler, it seems hardly probable that he would have been so eager to join us. He seemed quite conscious that we would take him away from his haunt; and this shows that he had formed no attachment to either persons or locality there. The love of locality is doubtless more observable in the cat than the love of persons; while the reverse is true of the dog. Cats are never so demonstrative in their expression of attachment as dogs; and I suspect that the associations of human domesticity has much to do with the attachment to locality which cats manifest. It is true that Jerry was an unusually intelligent cat; and his case may be a somewhat exceptional one. But I cannot help thinking that there is yet much for us to learn of the psychology of this alleged well-known animal.—*C. A. White.*

NOTE.—Dr. Crichton Browne, Vols. I and II, "West Riding Asylum Reports," states that the greater size of the head in civilized races, unaccompanied by a proportionate increase in the pelvic diameters, is an influence operating to a great extent in the production of idiocy, imbecility and insanity.—*S. V. Clevenger.*

ANTHROPOLOGY.[1]

THE INDIAN CENSUS. — Mr. Sherman Day, in the *Overland Monthly* for November, speaks of the remissness of the census officers with respect to the enumeration of Indians. He has compiled a table of our Indian population which combines the meager returns of the census, the data of the Indian Office, and some investigations of his own, as follows:

States.	*Total, including Ag'cy Indians.*	*Indians outside.*	*Agency Indians.*	*Total Indians.*
Alabama	1,262,505	213		213
Arkansas	802,525	195		195
California	866,342	13,601	4,324	17,925
Colorado	195,252	154	925	1,079
Connecticut	622,700	255		255
Delaware	146,608	5		5
Florida	269,493	180		180
Georgia	1,542,180	124		124
Illinois	3,077,871	140		140
Indiana	1,978,301	246		246
Iowa	1,624,965	466	350	816
Kansas	996,995	815	899	1,714
Kentucky	1,648,690	50		50
Louisiana	939,946	848		848
Maine	648,936	625		625
Maryland	934,943	15		15
Massachusetts	1,783,085	369		369
Michigan	1,646,732	7,249	9,795	17,044
Minnesota	785,155	2,300	4,372	6,682
Mississippi	1,131,597	1,857		1,857
Missouri	2,108,380	113		113
Nebraska	456,341	233	3,939	4,174
Nevada	70,097	2,803	7,831	10,634
New Hampshire	346,991	63		63
New Jersey	1,131,116	74		74
New York	5,087,987	819	5,116	5,935
North Carolina	1,399,750	1,230		1,230
Ohio	3,198,062	130		130
Oregon	179,239	1,694	4,471	6,195
Pennsylvania	4,282,891	184		184
Rhode Island	276,531	77		77
South Carolina	995,577	131		131
Tennessee	1,542,359	352		352
Texas	1,591,857	992	108	1,100
Vermont	332,286	11		11
Virgina	1,512,565	85		85
West Viirginia	618,457	29		29
Wisconsin	1,323,253	3,161	7,756	10,917
Total in States	49,418,560	41,890	49,896	91,786

[1] Edited by Professor OTIS T. MASON, 1305 Q street, N. W., Washington, D. C.

Territories.	*Total, including Ag'cy Indians.*	*Indians outside.*	*Agency Indians.*	*Total Indians.*
Arizona	57,661	3,493	17,221	20,714
Dakota	166,273	1,391	31,096	32,487
D. Columbia	177,624	5		5
Idaho	36,862	765	3,652	4,417
Montana	57,864	1,663	18,705	20,368
New Mexico	146,242	9,772	26,677	36,449
Utah	146,334	807	2,371	3,178
Washington	88,219	4,405	13,103	17,508
Wyoming	22,562	140	1,782	1,922
Indian Ter	79,024	5 tribes other tribes	60,036 } 18,988 }	79,024
Total organized Territories	978,665	22.441	193,631	215,072
Alaska (estm.)	33,426	31,250		31,240
Terr. with Alaska	1,012,091	53,681	193,631	247,312
Grand Total	50,430,651	95.571	243.527	339,098

Total Indians without Alaska, States		91,786
" " " " Territories		216,072
" " " "		307,858
" " with "		339,098
Agency Indians, States	49,896	
" " Territories	193,631	
Total agency Indians	243,527	

BRITISH ANTHROPOLOGY.—The Journal of the Anthropological Institute commences each volume with what we call the fiscal year. No. 2 of Vol. XIII appeared in November. The original papers of general import, are as follows:

On some customs of the Aborigines of the River Darling, N. S. Wales. By Frederick Bonney.

The nature and origin of group marriage. By C. Staniland Wake.

Notes on stone implements from S. Africa. By Maj. H. W. Feilden.

Notes on Relics of the sign and gesture language among the Malagasy. By Rev. James Sibree.

On some Australian beliefs. By A. W. Howitt.

On the Botocudos. By A. H. Keane.

The Ethnology of Germany (Part VI), the Barini, Barangians and Franks. Section II. By Henry H. Howorth.

Mr. Bonney speaks from an experience of fifteen years, and repudiates the assertion that the Australians are the lowest type of mankind. Infanticide is practiced from humane motives, the infant immediately after birth being dispatched by the mother's brother, by a blow on the back of the head, strangling with a rope, or choking with sand. The initiation of the youth is painful and tedious, and many seek to defer the day. After its completion the young man may marry. They believe that sick-

ness is caused by an enemy who uses certain charms, and is cured by the doctor practicing the sucking cure. A very sick person or an exhausted traveling companion is fed upon blood supplied from the veins of his friends. The burial customs are exceedingly interesting.

Mr. Wake sums up the later researches on group marriage and seeks to find its cause in two principles. First, sexual conduct is natural, and therefore permissible to all—implying a sexual right in every individual who attains a certain age; and second, sexual unions between persons without certain degrees of consanguinity are criminal.

Mr. Sibree follows up Colonel Mallery's investigations concerning gesture speech by independent researches among the Malagasy.

Mr. Howitt's paper was read by Mr. Tylor. All the tribes believe that the earth is flat, and that the sky is propped up on poles. Beyond the sky is the gum-tree country, the home of spirits and ghosts. Every man has within him a *Yambo*, or spirit, which can leave his body and wander even to the gum-tree country and talk with the spirits there, or converse with the wandering ghosts of other sleepers. The state of departed souls and their doings after leaving the human body fill a great part of Australian mythology. The dead are buried doubled up, the body lying on the side, and the usual deposit is made of the personal effects of the deceased. The author closes with an extended account of ghost-land.

Mr. Ribeiro having visited England with some Botocudo Indians, Mr. Keane took the occasion to explain the habitat and history of the tribe.

The papers of Mr. Howorth are all alike in this, that they belong to what may be called classic ethnology, and exhibit a great amount of close reading and critical study.

GERMAN ANTHROPOLOGY.—The fourteenth annual meeting of the German Anthropological Society was held at Trieste on the 9th, 10th, 11th, 12th August of the past year. The president was Professor Virchow, and the general secretary, Dr. Johannes Ranke. In attendance were 302 registered members. The chief attraction of the meeting was the old Roman remains, of which the city can boast the finest. Some of the most important addresses were the following:

Opening speech on the first use of metals. By Professor Virchow.

Trieste and its neighborhood, until the conquest of the Franks. By Dr. Hettner director of the museum.

Yearly progress of Science. By Dr. Ranke. [An excellent summary.]

Anthropological Catalogues. Herr Schaaffhausen.

MICROSCOPY.[1]

MAYER'S METHOD OF FIXING MICROSCOPICAL SECTIONS.[2]—The new fixative proposed by Dr. Mayer is prepared by mixing *the filtered white of eggs with an equal volume of glycerine*.[3] A little carbolic acid may be added as an antiseptic. A very thin and even layer of the fixative is painted upon the object-slide, which is then ready for receiving the sections. After the sections are placed, the slide is warmed a few minutes in the oven of a water-bath, just long enough to melt the paraffine. The paraffine is next dissolved away from the sections by turpentine, the turpentine removed by alcohol, and the sections then colored *in situ* on the slide.

As a coloring fluid, a strong alcoholic carmine is recommended. It is prepared as follows:

Dissolve four grams carmine in 100^{ccm} alcohol (eighty per cent) by boiling about thirty minutes, adding thirty drops of strong hydrochloric acid during the boiling. The solution should be filtered while hot, and the acid carefully neutralized by adding ammonia until carmine begins to be precipitated.

This fluid, which may require to be filtered a second time after cooling, stains uncommonly quick, deep and diffuse. To obtain a differential staining, it is well to stain deeply, and then partially decolor by washing with acidulated alcohol.

The decoloration should be checked at the moment when the film of the fixative become nearly or quite colorless.

PERCHLORIDE OF IRON AS A REAGENT FOR PRESERVING DELICATE MARINE ANIMALS.—In experimenting with a delicate class of marine infusoria (Tintinnodea), Dr. Fol[4] found that the reagents in common use for instantaneous killing, such as picro-sulphuric acid, osmic acid alone or in combination with chromic and acetic acid, and corrosive sublimate, failed to give successful preparations. He finally succeeded with perchloride of iron, a reagent quite new in histological technique. An alchoholic solution diluted to about two per cent will answer ordinary purposes; but a stronger solution should be used in case it is desired to kill a large number of animals in a large vessel. It will not do, however, to turn a saturated solution directly into sea-water, as precipitates would be copiously formed, which would utterly ruin the preparations. After the animals have sunk to the bottom of the vessel, most of the water may be turned off, and seventy per cent alcohol added. In order to remove from the tissues the ferric salts adhering to them, it is necessary to replace this alcohol with alcohol containing a few drops of hydrochloric acid.

[1] Edited by Dr. C. O. WHITMAN, Mus. Comp. Zool., Cambridge, Mass.

[2] Dr. Paul Mayer. "Einfache Methode zum Aufkleben mikroskopischer."

[3] Glycerine serves to keep the fixative moist while the sections are being placed. Schmitte. Mittheil Zoolog. Station at Naples, IV, p. 521, 1883.

[4] Fol, Beiträge zur histologischen Technik. Zeitschr. f. wiss. Zool. XXXVIII, p. 491, 1883.

The "fixation" of the animals in an expanded life-like form is perfect, and the action of the dilute acid is of so short duration that it causes no injury to the tissues. Not only infusoria and rhizopods, but also large pelagic animals, such as Medusæ, Ctenophoræ, Salpæ, Heteropods, Doliolum, &c., may be thus killed and transferred to alcohol, with their form, histological structure, and cilia perfectly preserved. After complete removal of the yellowish color due to the presence of ferric salts by washing in acidulated alcohol, the tissues of transparent animals remain almost free from cloudiness.

The best method of staining such objects is to add a few drops of gallic acid (one per cent solution) to the alcohol. After twenty-four hours the acidulated alcohol is turned off and pure alcohol added. Thus treated the protoplasm will take a light brown color, the nuclei a much deeper brown. Carmine stains too deeply and diffusely, and cannot be successfully removed.

THE PREPARATION OF DRY INJECTION-MASSES.—The variously colored gelatine emulsions in common use as injections, keep for only a short time, and have therefore to be prepared as occasion arises for their use. The dry emulsions recommended by Fol are very easily prepared and convenient in use. As they will keep for any length of time, they can be prepared in quantities, and thus be ready for use at any moment.

Carmine Emulsion.—One kilogram gelatine (softer kind used in photography), soaked in water for a few hours until thoroughly softened; after turning off the water, heat the gelatine over a water bath until liquified; and then add to it, little by little, one liter of a strong solution of carmine in ammonia. The mixture stiffened by cooling is cut up, and the pieces packed in a fine piece of netting. Vigorous pressure with the hand under water forces the emulsion through the net in the form of fine strings or vermicelli. These strings are placed in a sieve and washed until they are free from acid or excess of ammonia; then collected and re-dissolved by heating. The liquid is poured upon large sheets of parchment which have been saturated with paraffine, and these sheets are then hung up to dry in an airy place. The dried layers of the emulsion, which are easily separated from the parchment, may be cut into strips and placed where they are protected from dust and dampness.

The carmine solution used in this emulsion is prepared as follows:

A strong solution of ammonia is diluted with 3–4 volumes of water, and carmine added in excess. After filtering, the solution is mixed with the gelatine, and then enough acetic acid added to change the dark purple-red into blood-red. It is not necessary to completely neutralize the ammonia.

The dry emulsion requires only to be placed in water for a few minutes and melted over the water-bath, to be ready for use.

Blue Emulsion.—A slightly modified form of Thiersch's formula:

1. To 300^{ccm} of melted gelatine add 120^{ccm} of a cold-saturated solution of green vitriol (ferro-sulphate).

2. To 600^{ccm} of melted gelatine add first 240^{ccm} of a saturated solution of oxalic acid, then 240^{ccm} of a cold saturated solution of red prussiate of potash (potassic ferricyanide).

3. No. 1 poured slowly into No. 2 while stirring vigorously; the mixture heated for fifteen minutes.

4. After cooling, the emulsion is pressed through netting, the vermicelli washed and spread on waxed paper for drying. In this case the vermicelli must be dried directly, as they do not melt well without the addition of oxalic acid.

The dry vermicelli are prepared for use by first soaking in cold water, and then heating with the addition of oxalic acid enough to reduce them to a liquid.

Black Emulsion. — 1. Soak 500 g. gelatine in two liters of water, in which 140 g. of common salt have previously been dissolved, and melt the mass on the water-bath.

2. Dissolve 300 g. nitrate of silver in 1 liter distilled water.

3. No. 2 poured very slowly into No. 1 while stirring. An extremely fine-grained emulsion may be obtained by using 3–4 times as much water in Nos. 1 and 2.

4. No. 3 pressed into vermicelli as above, and then mixed with No. 5 by clear daylight.

5. Mix 1½ liter cold-saturated potassic oxalate with 500^{ccm} of a cold-saturated solution of ferro-sulphate.

6. No. 4 mixed with No. 5 gives a thoroughly black emulsion, which should be washed several hours, again melted and finally poured in a thin layer on waxed paper.

A gray-black emulsion may be obtained by using 240 g. potassic bromide in the place of common salt in No. 1, the remaining operations being the same.

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SCIENTIFIC NEWS.

— The Trustees of Williams College engaged last spring, for a series of years, one of the tables at Dohrn's International Zoölogical Station at Naples. It has until recently been occupied by Dr. Edmund B. Wilson, a graduate of the Sheffield Scientific School, and of the Johns Hopkins University.

His occupancy of the table illustrates the principles which will guide the authorities of the college in making an appointment to this trust. Any American naturalist, already distinguished for research, may apply for the use of the table by writing to President Carter. And while a graduate of Williams College, of scholarly eminence, will be regarded as having a superior claim, the appointment will, in no case, be given to a

naturalist who does not give evidence of ability to do original work.

It is expected that each occupant of the table will give, soon after his return to this country, a brief course of lectures in the Natural History lecture room, at Williams, on some subject connected with zoölogical work.

The table is now held by Professor Clarke, but it will probably be vacated on or before April 1st, 1884. The successful applicant will be informed of his appointment as soon as practicable after it is made, and the name will be also communicated to *Science* and the AMERICAN NATURALIST, for publication.—*Williams College, Dec., 1883.*

— The camels now running wild in Arizona were bought by the United States Government in Asia Minor. There were seventy-six camels in the first "colony." They were first employed in packing between Fort Tejon and Albuquerque, in some instances carrying 100 gallons of water to the animal, and going nine days without water themselves. Tiring of the camels, the Government condemned them and they were sold at Benicia to two Frenchmen, who took them to Reese river, where they were used in packing salt to Virginia City. Afterwards the animals were brought back to Arizona, and for some time were engaged in packing ore from Silver King to Yuma; but through some cause or other the Frenchmen became disgusted, there being no market for camels just then, and turned the camels loose upon the desert near Maricopa wells, and to-day they and their descendants are roaming through the Gila valley, increasing and multiplying and getting fat upon the succulent sagebrush and greasewood with which the country abounds.—*Tombstone Epitaph.*

— The Puget Sound *Argus* says: "Mount Adams, in Washington Territory, was recently ascended by a large party. They reached an elevation of 12,650 feet. The crater was penetrated a distance of 100 feet. There was a ceaseless drip of water from the roof of the ice-incased entrance, caused by a warm-air current coming from the slumbering fires far below, whence a loud, hissing noise arose. A rock hurled down produced a deafening reverberation." The height of Mount Adams, which is a conspicuous object for a great distance throughout this general region, is stated by Jewett, on the authority of Vansant, at 13,258, and by Petermann at 9570 feet, the latter is probably an error, as it is certainly one of the highest peaks of the Cascade mountains.

— Henry Holt & Co., New York, have recently published Packard's Briefer Zoölogy, as one of their American Science Series, Briefer Course. It is designed for use in grammar and high schools. In part re-written and made simpler than the larger Zoölogy by the same author, portions of that work have been retained, with additions regarding the habits of birds and

common mammals. A number of illustrations, especially of birds and mammals, appear in it not contained in the larger volume. It is a book of 334 pages.

— An admission fee of fifty cents is now charged visitors to the ostrich farm at Anaheim, Cal. The object of the tariff is to discourage the rush of visitors, who seriously interfere with the work of the farm. The birds are breeding and require careful attention and freedom from disturbance.

— Major J. W. Powell is delivering some lectures on Social Evolution before the Philosophical Society of Washington.

— Mr. Robert B. Tolles died Nov. 18, 1833, at Boston. For many years Mr. Tolles held the highest place in America as the manufacturer of microscopic lenses and triplets, as well as other microscopic apparatus, devised by himself. His death is a loss to the scientific world.

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PROCEEDINGS OF SCIENTIFIC SOCIETIES.

PROCEEDINGS OF THE PHILADELPHIA ACADEMY OF NATURAL SCIENCES.—Oct. 3.—Professor Heilprin discussed the cotemporaneity of geological formations.

Oct. 11.—Rev. Dr. McCook spoke of the parasites infesting the cocoons of spiders. The cocoons of ichneumon flies, of the genus Pezomachus, were found in the cocoons of *Argiope riparia* and *Epeira atrata* of the Pacific coast, but these were in their turn infested by chalcidians. From the cocoon of the last-named species several small beetle larvæ of the genus Trogoderma were also extracted, together with some ants of the genus Solenopsis.

Oct. 18.—Mr. J. A. Ryder described *Gastrostomus bairdii*, a strange fish dredged off the Massachusetts coast at depths of from 500 to 3000 fathoms. A comparison was made between this species and the Eurypharynx of the Mediterranean. In the American form the jaws are still more remarkably developed, so that they are seven times the length of the head. The extensible membrane of the upper jaw, and the pouch pendant from the lower, cause the mouth to be a vast funnel, to which the body seems an insignificant appendage. Probably the food is partly digested, as well as collected and stored, in this receptacle. The gills are placed far behind the skull, the gill-openings are mere pores, the opercular bones are absent; a membranous fold is situated near the tail, and the ova, as in eels, drops directly into the alimentary canal. The eyes are functional.

Nov. 1.—Mr. J. Willcox detailed his observations upon the soil of parts of Canada and New York, and stated his belief that the great glacier had removed the original soil, and in its retreat had deposited the existing coat, always thinner than that to be found

south of the terminal moraine. Professor Heilprin called attention to the presence of fragments of trilobites among fossils from rocks of the Hamilton period in Pike and Monroe counties, where Professor J. C. White had been unable to discover them.

APPALACHIAN MOUNTAIN CLUB.—Dec. 12, 1883.—Report of the councilor of topography, J. R. Edmunds; Nordenskjöld's Greenland expedition, by Professor Wm. H. Niles; Twin Mountain range and valley of the East branch, by R. K. Wood; an ascent of the Giant's Stairs (postponed from Nov. 14); ascents of Mts. Hale, Pliny, and Caribou, by E. B. Cook; a partial exploration of Mt. Wildcat, by Miss M. M. Pychowska.

Special Meeting, Dec. 19.—Optical illusions among the mountains, by Professor Charles E. Fay.

BIOLOGICAL SOCIETY OF WASHINGTON.—Dec. 14.—Papers were read by Professor C. V. Riley on the use of napthaline in medicine and as an insecticide; by Mr. Henry W. Elliott, concerning the appetite of the muskrat; by Dr. R. W. Shufeldt, the anatomical collections of the Army Medical Museum.

Dec. 28.—Communications were presented by Dr. Thomas Taylor on napthaline, its effects on seeds, plants, insects and other animals; by Mr. J. A. Ryder on the structure of the egg-membrane; by Dr. W. S. Barnard some results by *massage et contre coup;* and Mr. Romyn Hitchcock exhibited an improved form of microscope.

NEW YORK ACADEMY OF SCIENCES.—Dec. 10.—The following paper was read: The geology, botany, and scenery of the Yellowstone National Park (illustrated with lantern views), by Dr. J. S. Newberry and Professor H. L. Fairchild.

Dec. 17.—The following papers were presented: 1. The literature of ozone and peroxide of hydrogen (second memoir), including: I. Historical-critical résumé of the progress of discovery since 1879; 2. Index to the literature of ozone, 1879–1883; 3. Index to the literature of peroxide of hydrogen, 1879–1883; II. Facts gathered from eight years of personal inspection, as to the alleged destruction of the Adirondack forests, by Professor Albert R. Leeds.

BOSTON SOCIETY OF NATURAL HISTORY.—Jan. 2.—Dr. Kneeland spoke of the cause and consequences of the recent earthquake at Ischia, giving lantern illustrations.

The secretary showed a description and drawing of the "sea serpent" lately seen at Long Branch.

AMERICAN GEOGRAPHICAL SOCIETY.—Dec. 17.—Mr. Alfred R. Conkling delivered a lecture entitled "Mexico; her Physical Geography and Resources," illustrated with thirty stereopticon views.

Jan. 8.—Rev. C. C. Tiffany, D. D., delivered a lecture entitled "Norway and the Midnight Sun," illustrated with stereopticon views.

THE SOCIETY OF NATURALISTS OF THE EASTERN UNITED STATES held its winter meeting in Columbia College, New York, Dec. 27 and 28. There was a large attendance of members and a goodly list of papers presented, as will be seen by the titles given below. The meeting was opened by an address by the president setting forth the aims and objects of the organization. The following officers were elected for the ensuing year: President, Professor Alpheus Hyatt, of the Boston Society of Natural History; vice-presidents, Professor H. N. Martin, of Johns Hopkins University of Baltimore, and Professor A. S. Packard, Jr., of Brown University, Providence; secretary, Charles Sedgwick Minot, of Harvard Medical School; treasurer, Professor William B. Scott, of Princeton, and executive committee at large: Professor H. C. Lewis, of the Philadelphia Academy of Natural Sciences, and Lester J. Ward, of the United States National Museum.

A committee was appointed to act with the executive committee in defining what a "professional naturalist" is. A resolution was adopted that the society, recognizing the great importance of a thorough knowledge of modern languages, especially French and German, to students of natural history, regards it as a hopeful sign that a conference of professors in this department is now assembled, and expresses its sympathy with their work. A committee was also appointed to confer with the section of biology of the American Association for the Advancement of Science.

TITLES OF PAPERS READ:

Application of photography to the preparation of natural history figures and charts. By S. H. Gage.
Adaptation of lectures to large classes. By W. H. Niles.
Mode of making models of gigantic Cephalopods. By J. H. Emerton.
Preparation of rock-sections. By James Hall.
On some methods of pursuing teratological researches. By Harrison Allen.
Methods of section cutting. By E. B. Wilson.
Arrangement of a museum of vertebrates. By B. G. Wilder.
Academies of science. By E. D. Cope.
Use of pure carminic acid in staining. By G. Dimmock.
Bleaching skeletons by peroxygen of hydrogen; skeleton holder. By S. H. Gage.
Instruction in mineralogy and petrography. By M. E. Wadsworth.
Arrangement of minerals in museums. By H. C. Lewis.
Methods of mounting museum specimens for exhibition. By A. Hyatt.
Good and bad timber. By J. T. Rothrock.
Evolution and histology. By C. S. Minot.
Preparation of organs. By B. G. Wilder.
Biology in the Northwest. By W. Trelease.
Necturus for laboratory use. By B. G. Wilder and J. H. Gage.
Immersion apparatus. By Alexis Julien.
Museum administration. By G. B. Goode.
Method of lecturing to large classes. By A. S. Bickmore.
Various methods of carmine staining. By B. Sharpe.